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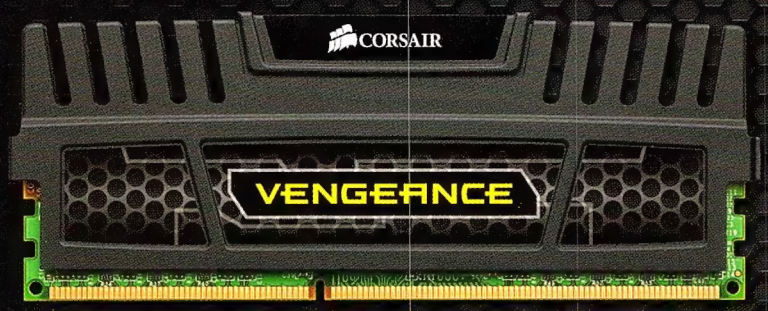

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EDHEAD

Is it upgrade time already?

It doesn't seem like it was all that long ago that I was closing up the case of my last big PC building project, and powering up my new system for a couple of hours of Napoleon: Total War.

It was a good build, too, but damnit if it doesn't feel like we'll soon be embarking on a whole new project.

And it's not like that 'old' system is really lacking – it's got a top-end Core i7 on a P55 board, and originally a toasty-fast OCZ SSD and a reference 4870 X2. We could go into the speeds and details, but to be perfectly honest, as much as I've always been a maximum power computing guy, the bits have always been more of a means to an end. I much rather leave the fiddly stuff to folks like Justin, or our current stand-in reviewer, Vito Cassissi.

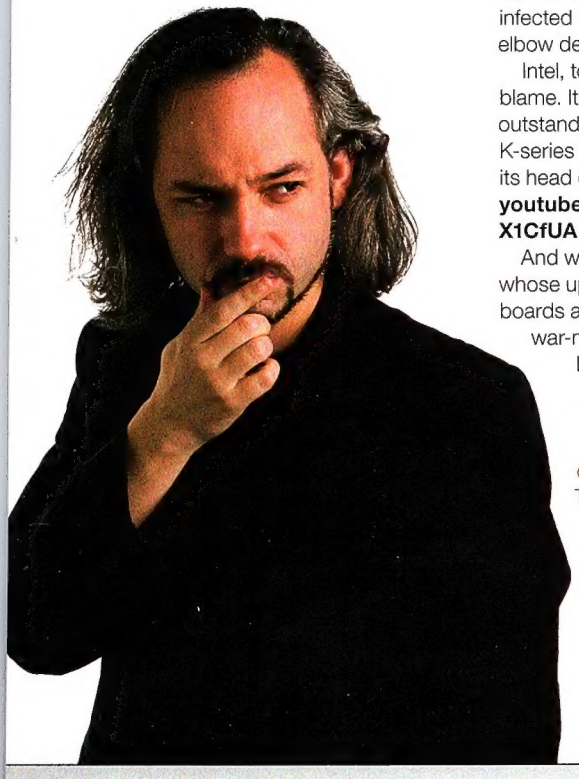
Of course, our machine's had a few changes... the SSD sadly bricked itself after a firmware update, and we've been rather too lazy in not replacing it. And we've upgraded the video card to a speccy (then) new 5970. It's a sweet system, and I honestly can't think of any game or task it cannot handle with casual aplomb. But nonetheless...

I blame Ashton Mills, in part. He's been detailing his latest building exploits in his Technica Obscura column, and he's infected us with that nasty itch to get elbow deep in some PC parts.

Intel, too, must shoulder some of the blame. Its new Sandy Bridge parts are outstanding chips, and the unlocked K-series is turning overclocking on its head (as in this Intel video - **www.youtube.com/watch?v=_GR5_X1CfUA** – which just makes us cry).

And we just might blame Gigabyte, whose upcoming military-themed gaming boards already have us drooling in lame, war-nerdy anticipation.

Back to the workbench...



David Hollingworth
dhollingworth@atomicmpc.com.au
Twitter: @AtomicMPC
Facebook: AtomicMPC

atomicCREW

haymarket

editorial
editorial@atomicmpc.com.au
editor david hollingworth
deputy editor justin robinson
editorial assistant ewa grygier

design
art director david west
product photography grant turner
creative director sam grimmer

contributors: dan rutter, ashton mills, chris taylor, jake carrol, ben mansill, john gillooly, james matson, vito cassissi

production
group production manager angela sutherland
production manager ewa 'nienor' grygier
printed by webstar

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(02) 9282 8777
gordon & gotch new zealand
(09) 625 3005

advertising + marketing
t+61 2 8399 3611 f+61 2 8399 3622
group advertising manager joanne nichols
jnichols@haymarketmedia.com.au

haymarket media
t+61 2 8399 3611 f+61 2 8399 3622
50 victoria street, mcmahons point
nsw 2060

managing director jeremy vaughan
commercial director darren mcnally
publishing manager phil vella

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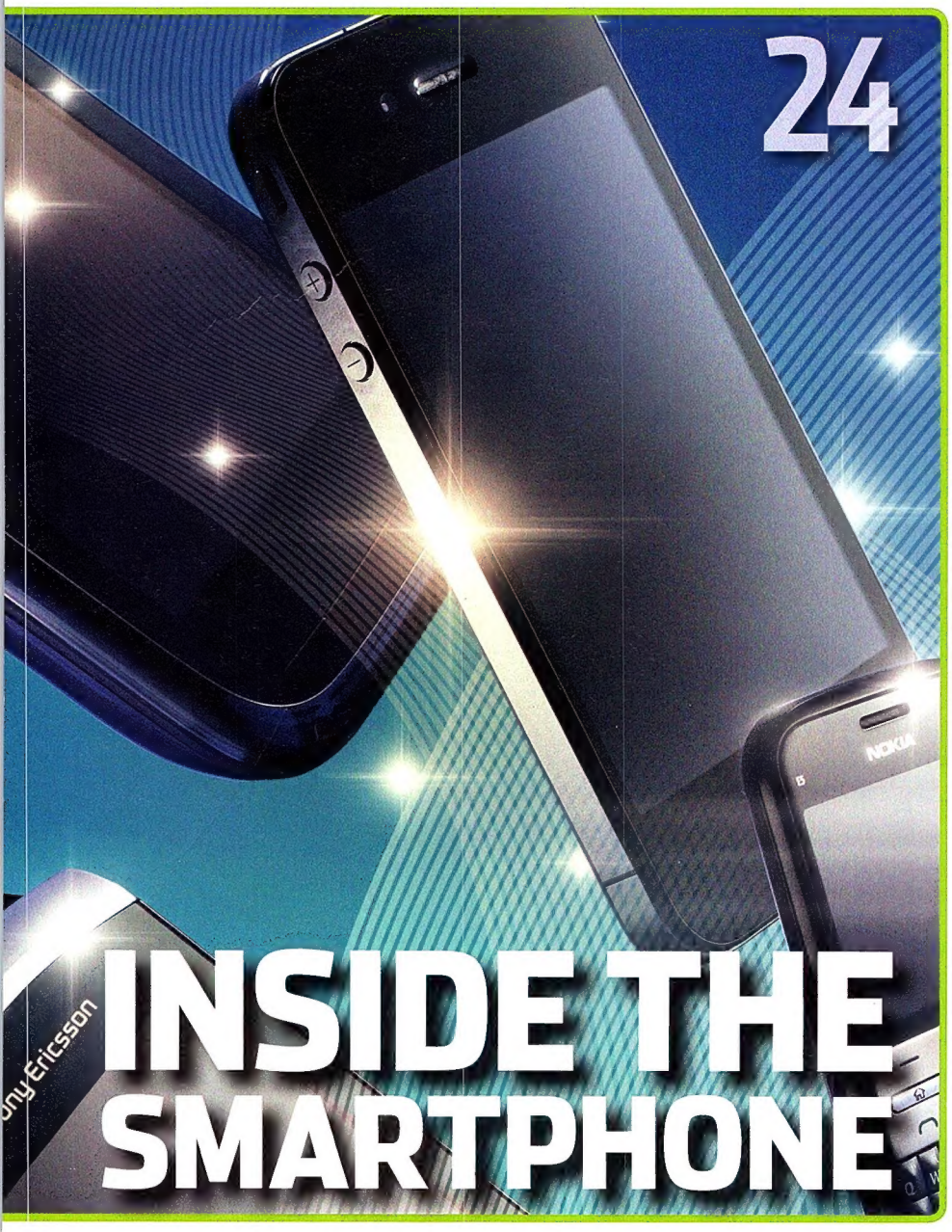

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Intel confirms DX11 processor graphics in the pipeline

At last month's Sandy Bridge launch Atomic grabbed a few minutes with Intel VP Mooly Eden to talk about the relevance of integrated graphics to a hardcore audience.

Sandy Bridge has been a massive launch for Intel, and last month one of the stars of the Mobile team responsible, Mooly Eden, swung through Sydney to launch the CPUs.

Mooly is now a Vice President of Intel, and handles the PC Client Group. He is also one of Intel's most entertaining, and an engineer to boot, so the launch proved both entertaining and informative.

We did get to see Portal 2 in action, running on the processor graphics of a Sandy Bridge processor. It actually looked pretty impressive, despite the obviously lower than ideal settings used.

The post-keynote question and answer session was largely taken up with journalists trying to beat up stories about the Intel Insider technology (essentially a DRM engine designed to enable Hollywood studios to stream HD video to a computer securely). They ranged from worries that it would stop pirated movies from working to it being a backdoor into peoaple's systems. Intel obviously denied all accusations, but it did mean that the question and answer session was remarkably information poor.

We caught Mooly after the presentation and ask him some geekier questions concerning the state of processor graphics and what Intel's future plans were, especially with regards to DirectX 11 and GPGPU support through OpenCL and DirectCompute. Some technologies like QuickSync (which offers really impressive video transcoding) will only work when you are running processor graphics. A P67-based desktop system, for example, won't get any advantage from the technology.

The term 'Switchable Graphics' refers to technology like Nvidia's Optimus, which was conceived to get around the on-package graphics in the first generation Core I mobile processors. There has been talk of bringing the technology to desktop systems now that all new Core I CPUs will have graphics on-die, but we are yet to see a working implementation.

For the video of our chat with Mooly, go to **http://bcove.me/4jft2pdk**.

You said:

Alex8337: *"They ALWAYS say 'These new CPUs deliver a noticeable performance boost over previous generations of products'. Then why does my core2 quad still kick ass?"*

GhostFaceKilla: *"Gone are the days where I could have my CPU last 3 years yet continue to see performance gains by installing a new model GPU. Sorry NVIDIA and ATi - I am going to need more convincing before I fork over any more of my money."*

Portal 2 hooks up PS3 to Steam

More information comes on Valve's online gaming service Steam, alongside juicy Portal 2 news.

When Valve announced that they would be bringing their popular online gaming service to PlayStation 3 users back in June, we had a few questions as to how it would work.

As detailed by Gamespy, Valve are launching Portal 2 on the PS3 on April 19 in Australia, and it will include most Steam functionality available to PC or Mac gamers, with chat services and cloud storage available for game saves.

While save files are not compatible across platforms, this is still a nice redundancy that helps to prevent corrupted files and maintain progress throughout the campaign.

This move to a steamier PS3 experience also suggests a big step towards bringing console gamers closer to their mousier cousins, as Portal 2 is now offering its extensive co-operative campaign as well as multiplayer matches between any user of the game on either platform.

There will be no Steam functionality for Microsoft Xbox 360 users.

How this will affect re-selling or trading of Portal 2 on PS3 is unclear, but we'll keep our ears to the ground for any info.

You said:

V1RUS: *"To be honest I like the idea but this in my opinion will ruin the industry."*

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MAXIMUM POWER COMPUTING

FROM ATOMIC ONLINE

Can you believe that? We're already nearly a quarter through 2011. Crazy times!

And it's been crazy-awesome times on the Atomic forums, and we've find the awesomest posts to celebrate for our Post of the Month. Woohoo! And who get us woohooing to the max?

The honours, and a Razer BlackWidow, go to **smakme7757**, for his brilliant tutorial on setting up an OpenVPN Access Server. Sweet techy stuff, sweetly delivered. **http://forums.atomicmpc.com.au/index.php?s=&showtopic=38535&view=findpost&p=773544**

But let's not forget our runners up, who also deserve some mighty pats on the back!

Caelum lays down some awesome cycling knowledge. **http://forums.atomicmpc.com.au/index.php?showtopic=38845&st=0&p=779634&#entry779634**

Redhatter performs an essential service - tracking down the whereabouts of flood affected Atomicans. **http://forums.atomicmpc.com.au/index.php?showtopic=39073&st=0&p=784156&#entry784156**

And finally, **bolt_krank** has an awkward video moment... **http://forums.atomicmpc.com.au/index.php?showtopic=39076**

Thanks one and all for playing - see you next month!

POTM
WINS A RAZER BLACKWIDOW!

MODIFICATION with Ashton "One Mod To Rule Them All" Mills

Borderlands Vivid mod

Game Borderlands
URL www.moddb.com/mods/borderland-vivid-mod

Love the cell-shaded goodness of Borderlands, and think it can't get any better? Ah, but it can – with the Borderlands Vivid mod, which takes the unique visual flair of Borderlands and snazzes it up with brighter colours, enhanced bloom and ambient occlusion, reflections and shadows.

While visual enhancement mods often make use of replacement textures and models, the Borderlands Vivid mod makes no actual changes to the game itself. Instead, it uses an impressive DLL replacement tool by a Russian programmer called ENB Series which has been around for many years now. It was originally written to add shader effects to Grand Theft Auto – enhancing skylighting, improving colours and shadows, and adding ambient occlusion – but was later expanded to support games including Oblivion, Resident Evil and Dragon Age. The full list of its features is extensive, encompassing colour correction, shadows, reflections, bloom effects, SSAO (ambient occlusion), motion blur and depth of field. And, as it intercepts DirectX calls, it can work most games usually through a little trial and error in the config file.

And that's what the author of the Borderlands Vivid mod has done, to great effect (see before/after pics).

The only downside to ENB Series mods is the impact on frames – anywhere from five per cent to 30 per cent depending on what features are being used. If you've got a decent machine, it's usually worth it though.

The mod is a tiny download and if you have Borderlands you'd be crazy not to give it a go. Just be sure to read the installation instructions, and for more on see **enbdev.com**.

Circle of eight modpack 6.0

Game Temple of Elemental Evil
URL www.moddb.com/mods/circle-of-eight-modpack

Ah Troika, how we miss thee. Back in 2002 Torika released what is still considered the best of the very best D&D (Dungeons & Dragons, for those of you who see sunlight regularly) implementations in a classic Greyhawk campaign named after the same: The Temple of Elemental Evil. It stuck so closely to the official rulebook while giving that glorious advantage of being PC-based, that it garnered a huge following. So much so that – eight years later – the definitive modpack to improve the game is still going strong.

Like so many games these days, seemingly released in a beta state, one of the biggest complaints with ToEE was stability, so one of the primary aims of the modpack is bug-fixing. This alone would be worth the 230MB download, but the modpack goes further to improve the game with D&D rule compliance modifications, AI tweaks, content restoration, and some of the more popular fan-made quest scenarios, all seamlessly integrated.

atomic PATCH notes

EVE Online Incursion Patch v214372 to v221279

Battlefield 2142 Patch v1.51 Beta

Arx Fatalis Patch v1.21

Starcraft 2: Wings of Liberty Patch v1.2

The Sims 3 Patch v1.9.22.004002 to v1.10.6.004002

IL-2 Sturmovik: 1946 Patch v4.10

World of Tanks Beta Patch v0.6.1.5 to v0.6.2.7

There's also custom portraits, voice sets, new items and spells (from the official rulebook of course), new worldmap locations and a lot more. This is, after all, eight years in the making – to get a full list of all the changes head to the Circle of Eight forums at **www.co8.org/forum**.

If you want to get in on the action and re-live some classic D&D gaming on the PC, the Temple of Elemental Evil can be purchased cheap from second-hand game shops or online stores like Good Old Games (**www.gog.com**).

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Playon! HD Essential Media Player

Price: $185 Website: www.playonhd.com

Given that one of the selling points of the Playon!HD Essential is that it's designed for people who might not want the hassle of setting up a network, we're not quite sure it's the media player for the Atomic community.

That said, simple can be better, right? Just because we have these massive, complicated home networks set up, doesn't mean we have to use them for everything, does it? What if our modem breaks? How would we get all that tasty tasty television onto our big fancy screens then? What would we do of an evening? Watch *commercial* television? Read *books*? *Talk*?

Sometimes, it's best to have a back-up plan, and this could be just the thing. It comes with two terabytes worth of storage built-in, so it's perfect for all your essential rainy-day viewing, and Playon! do have a USB wireless dongle available, so it's not like you have to be completely offline.

Phew!

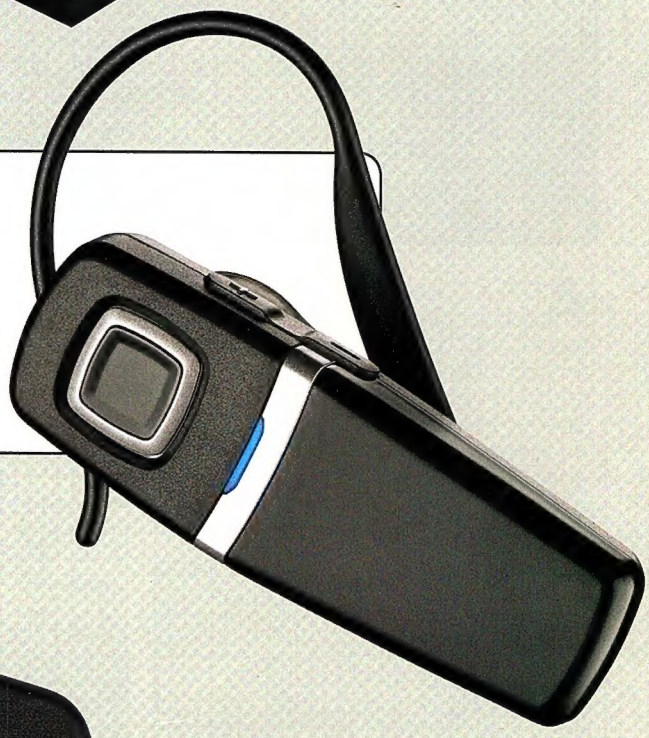
Plantronics GameCom P90

Price: $69 Website: www.plantronics.com/australia

Oh, the humble Bluetooth headset. It's capability to make the most senior executive looks like a crazy mumbling fool makes us laugh and laugh – at least until we're stuck next to said fool on a train. Then it makes us stabby.

At home, though, it's another story. The GameCom P90 is made specifically for PS3 gamers who like to strategise, chat and mock while they play – which means us. Except for the mocking. We would never, ever do that. Not which anyone else was home, anyway. They'd find that kind of behaviour incredibly immature.

It also allows us to answer nearby mobiles while gaming without getting up from the couch. How very professional …



3-in-1 PS3 Remote

Price: $69.95 Website: www.bluemouth.com.au

It might look like a kids toy, but this nifty little gadget means you never have to use your big standard PS3 controller to scroll through letters and very, very, slowly type your name into a leaderboard ever again. Nor do you have to remember which random gaming button is stop and which is rewind when watching DVDs.

And because it also has all your standard gaming buttons, you don't have to keep switching between a standard controller and this one. It might not be quite up to standard for hardcore gaming, but we do that on the PC wherever possible anyway, so this'll get us through more casual sessions.

Quite simply: Rather useful.

Microsoft Multi-touch Mouse

Price: $99.99 Website: www.microsoft.com.au

Now, we would never want to accuse Microsoft of jumping on any of the bandwagons that that other, fruit-flavoured, doctor-keeping-away tech company creates, but haven't we heard of this so-called 'multi-touch' technology somewhere before?

To be fair, the Microsoft version is black, and looks a mite more ergonomic than that *other* multi-touch mouse, and it's giving PC folks access to the technology that those *other* people have been 'enjoying' for quite a while, but we're not 100 per cent convinced. For a start, isn't that whole one-button thing pretty much at the top of the list of things we mock Apple fans for, mercilessly and relentlessly?

Thecus N7700-PRO-P

Price: $1399 Website: www.thecus.com

Every now and then, something comes along and makes us re-assess just how much storage we could possibly use, if we were forced to. Obviously, being the careful, precise types that we are, there's a certain amount of duplication going on. Redundancy, if you will. And given we're trying to fill, and not empty, there's none of the but-do-you-really-need-type soul-searching that can go on. Yes, for these purposes, we do really need each and every one of the three thousand photos we took on our most recent holiday, even the out-of-focus ones. And we really do need every single episode of every single television show we've ever watched, even the really, really crappy ones.

And yet, the fourteen terabytes that this little NAS unit will hold still seemed a little intimidating… until we remembered how quickly we filled that 'unfillable' terabyte drive, back in the day. This'll be juuuuuust fine.

Edifier breather iPod/iPhone dock

Price: $499 Website: www.edifier.com.au

Our first thought when we saw this was that, with a bit of strapping and some padded foamy additions, this would make a great helmet. A helmet that played our favourite music out the tops of our heads, radiating the sound outwards, thus annoying everyone we knew while protecting our own precious little ears from damage.

Then we thought that all that vibration would probably give us a bit of a headache, and, at nearly five kilos, it would probably end up doing a little bit of spinal damage. Plus, those glossy little feet…

So we have decided, very sensibly, that this is not the solution to our portable, wearable music dilemma. It is, instead, a pretty cool little unit for home or office use. Yes, I know, we've gotten boring in our old age. Sorry.

The science of search

Just what happens when you ask Google to find your favourite flavour of prOn?

Few people would admit to paying any attention to the little "About 527,000 results (0.08 seconds)" under the Google search box. Even fewer people would care about the number of results it found. But change that 0.08 seconds to 8 seconds, and there would most certainly be violence.

This month, we're going to investigate how and why when you ask for stuff, the universe (generally) delivers.

Queue a montage of Larry Ellison of Oracle fame, on one of his yachts, and something about database performance.

In search of something

Some of the time, the internet is used for research and to learn things. Oddly enough, Facebook isn't really the reason the Internet was created. It's a shocking revelation, we appreciate. Because of this occasional research and learning, plenty of methods to search or sort information have come about. These methods are employed in various combinations that together form the applications we know as search engines and database queries, amongst other commonly used constructs. The steps used to gain a result could loosely be considered algorithms.

Algorithms

Companies such as Google use patented algorithms to return results. We'd love to describe exactly how the mathematics behind Google's PageRank works, but we just don't know. Call it Google's competitive advantage. Despite this, through inference, we know that there are plenty of algorithms in the public domain that go into the making of techniques such as PageRank. These staples of the searching and sorting world will be familiar to any computer science student. A few of the more common search types are linear, binary and AVL. More common sort types include the heap, hash, bubble, selection, insert, quick and bucket.

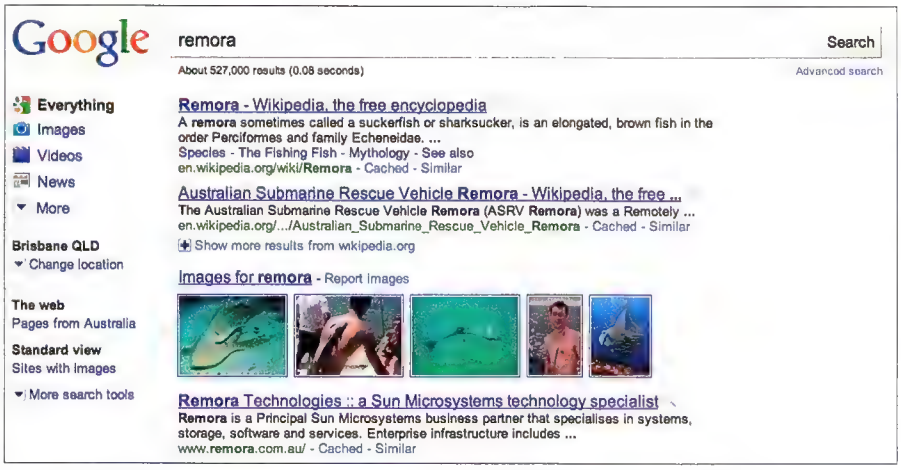
Don't think for an instant that this about enterprise databases, human resources records, grey business suits and search engines alone. Pretty much every interaction we have with computers is driven by search and sort functions now. Whether you're selecting weaponry in Red Dead Redemption, or changing your customisations on a power suit in Crysis 2, every time you scroll through a list, ordering that list by XP or HP and or ultimately applying changes, you are using search and sort algorithms. Further even to that, each of our basic interactions with our operating systems – including ordering items on screen, or flicking through dialog boxes and menus – is being driven by search and sort mechanisms.

In computer science, a search algorithm can be broadly categorised as a set of steps that's design is to find an item or collection of items in a larger superset of items. These items might be stored individually as records in a database, or they might be elements in a search space defined by a mathematical formula. It's not as scary as it sounds.

Trust us.

For explicitly stored items and data

Some data is stored in obvious ways. Whether it be an Access database that takes care of your grandmother's pickle and preserve collection, or it's an Oracle instance, taking care of $30 million dollars worth of transactions per minute for a large oil company, this is structured, stored and organised data. Linear and binary search trees can be employed here, as can heaps and hash tables.



The estimated number of search results, and the response time affixed to a Google query.

- Linear Search: The simplest search we've got. It simply trundles along, looking at every element until it finds what is asked of it. In terms of efficiency, it hurts. If you have a long list of things to find, the search time to find what you are looking for could be, at worst, as long as the list itself. Believe it or not, this is a special case of a brute-force mechanism.

- Binary Search: This locates the position of an item you are looking for in a sorted or ordered array. It works by comparing the input value with the middle element of the array. It then determines whether the compared value is higher, lower or the same as the input value. On this basis it can traverse left or right on a scale to get to where it needs to. This algorithm typically halves the number of items to search through with each comparison.

For virtual search spaces

Algorithms for searching virtual search spaces are a touch different. Closer to what you'd expect from a search engine, or looking for a needle in a haystack based upon certain criteria that you specify, these algorithms are used in what is known as constraint satisfaction problems (CSPs). These problems often exhibit extreme complexity, requiring heuristics to be solved in a reasonable amount of time.

Short of detailing the mathematics one can use to determine answers in CSPs, we can demonstrate a CSP by way of Sudoku. This is a combinatorial number placement puzzle, where the player must satisfy addition of columns, such that all columns contain all digits 1 through 9, whilst maintaining the addition rule. This is combinatorial because it references discrete, countable data structures.

When it comes to search engines, the constraints are the search terms of the end user. These terms are then finely honed based on country, date, time, size, file type, file extension et al. The results are then factored in using heuristics to show what is perceived to be the most relevant match. That odd concept of perception matters, too!

Heuristics

There were a lot of buzzwords kicking around in the early to mid 1990s about heuristics in computing. Fuzzy-logic was another one. A lot of the time these catch phrases were used to describe virus detection engines and virus scanner features, which made them stand out from the crowd. What heuristics is really about, however, is using strategies that employ readily accessible though sometimes only loosely applicable information that allows us to control problem solving time, difficulty and complexity in computing platforms.

Heuristics represent many of the things we do in every day life, especially when we problem solve, but most of us would rarely say to ourselves:

"I'm going to use a heuristic to figure this problem out!"

Examples of such heuristic tools we use every day without knowing it include:

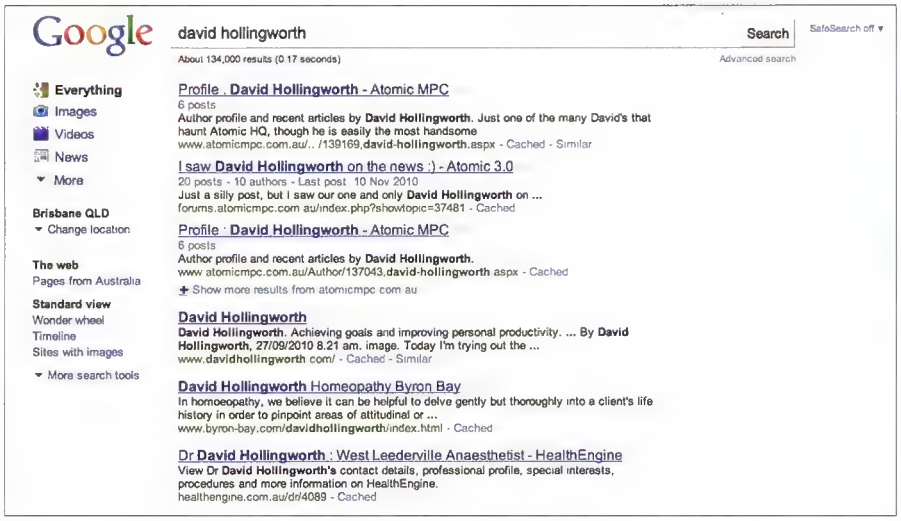
- When we have difficulty understanding or grasping a problem, we draw a picture of it.
- When a solution to a problem isn't known, or we're confused, we try assuming there is a solution already.
- When problems are abstract, and difficult to contemplate, so we try finding concrete examples, to associate with the problem.
- Trying to solve less complex and more general problems first (this is known as the Inventor's Paradox – where the more ambitious plan may have a higher likelihood of success).

If we stop and think about these four points, we really do employ them more often than we think. How do they apply to search engines though?

When we string search terms together in a search phrase, plenty of the algorithms we alluded to earlier are used, but these structures alone are not good enough to return to us results of perceived relevancy. That perceived relevancy could only come from known information, gathered intelligence and inference. An example might be a search for an individual's name.

The search engine has plenty of tricks up its sleeve to determine the fact that we were looking

Don't think for an instant that this is about enterprise databases, human resources records, grey business suits and search engines alone.



How does this search engine know that we had this particular person in mind, and not the random blog post from some guy in Ireland that likes blogging about insomnia and personal productivity?

for a specific individual. Some heuristics are considered.

1. It knows where we live based on IP range registered with IANA and similar services.
2. It knows something about our personal profile based upon 'hang on' services such as the Google Latitude service, and GPS assistive APIs.

It is aware of the things we commonly search for and has a fair idea of the things we like to browse. Why would a user whose queries are predominantly related to the computing sector, or technology be interested in a person who's into hiking and taking photos of rainbows and not a computing forum or associated site?

These very basic things form extremely powerful chunks of information that a search engine can use to guess which results best suit the user driving behind the keyboard. Technologies such as Google's AdSense aren't much different in this regard. These constructs form the basis of targeted and aware advertising. At this point, a user might be coerced into believing there is human intelligence behind all of this, as the true art of artificial intelligence in computing is applied.

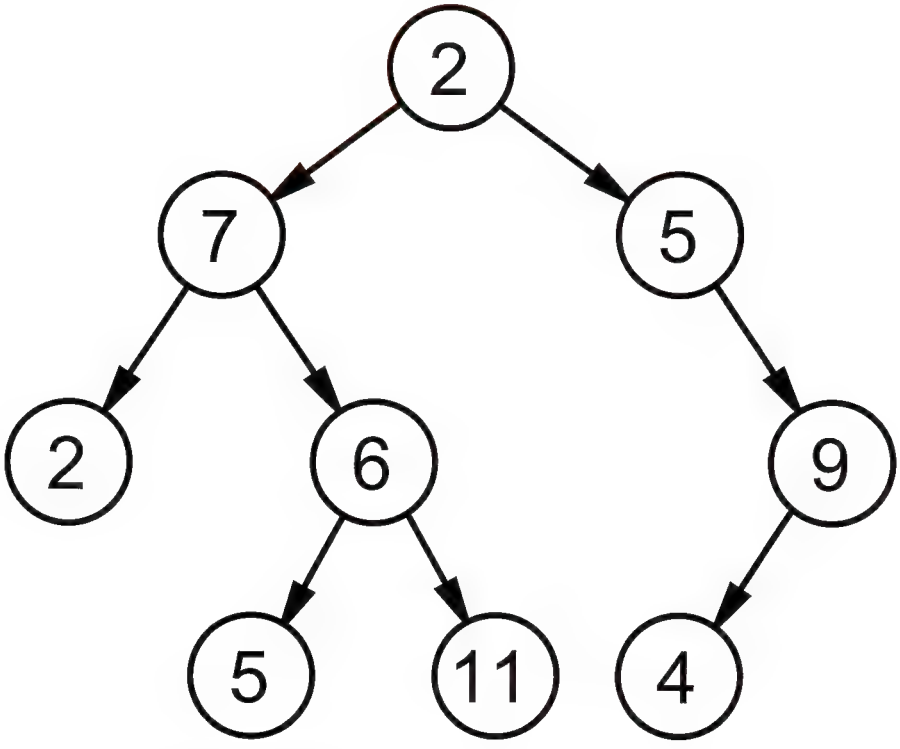
Computational complexity

Everything in life has a price. So to do the operations our computers carry out. Each little operation that is carried out has a calculated amount of complexity (best case, average case and worst case), and within that, a workload exerted against our CPU. When the designers of the software we take for granted analyse their code, they pay a lot of attention to computational complexity. One could argue that, in this day and age, little things like the behaviour of a 'for' loop or an 'if' statement isn't that important, because we have so many cores, threads and GHz of capability. It all adds up however, and when highly scalable systems are concerned, this stuff is still entered into as a matter of good design principles. 3D games engines are heavily scrutinised, as are the algorithms used in the super massive search engines. These are the things that make people like iD Software's John Carmack a widely reputed genius.

```
int index = 5;
int item = list[index];
if (condition true)
      then
            perform some
operation that runs in constant
time
            else
                  perform some other
operation that runs in constant
time
  for i = 1 to 100
  for j = 1 to 200
  perform some operation that runs
in constant time
```

We call this constant time, or O(1). An example of constant time might be accessing an element in a cache of results listed in a search engine, because getting to that result only ever takes ONE operation.

Because binary searches typically halve the amount of time required to find a result on each successive operation, we call the time taken to find something, or for a binary search to take place, 'logarithmic time'. Plotted on a graph, it looks like a curve approaching an infinitely close point (also known as an asymptotic curve).



Binary Search tree exhibiting O(Log *n*) time.

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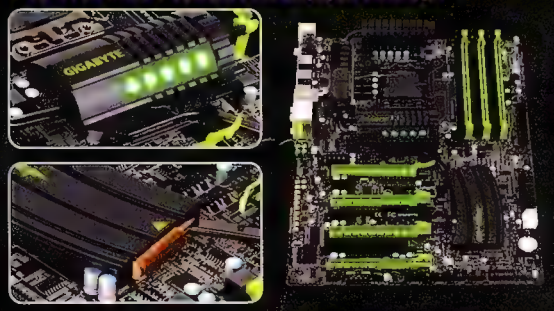

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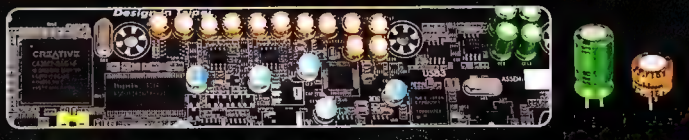

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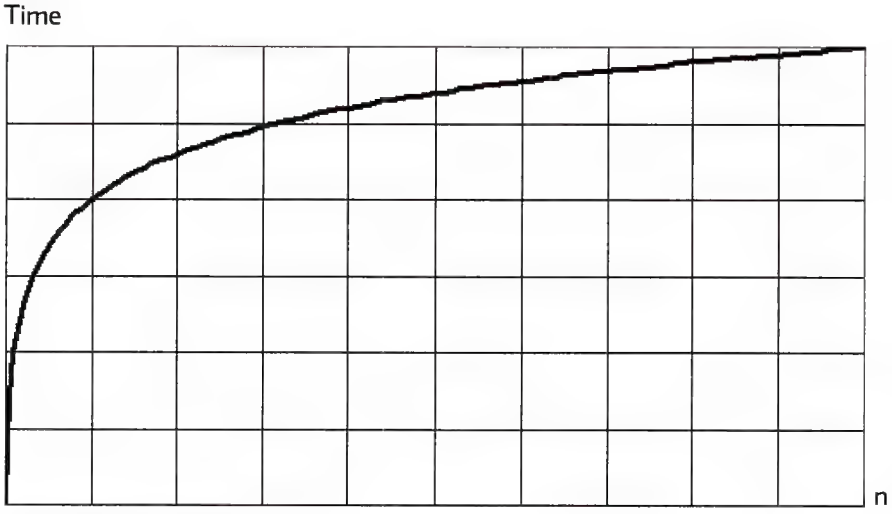

O(Log *n*) plotted on a curve.

So, going back to our search engine, and how it relates. Search engines will utilise a diverse mixture of operations, whether it be in the O(1) space, or O(Log n). Because of this behaviour, it's often very hard to accurately predict performance requirements (and thus, what hardware to use!) in building infrastructure to suit such spiky, massive and non-uniformly evolving workloads.

Meeting demands

Solving these workload problems is no mean feat. Companies invest millions of dollars in finding new ways to use current hardware and commodity devices to do more. Such is the success story of Google. We don't want to sing praise for everything the company has done, as Google's own moral compass is in question in the press and media on a regular basis, but it does indeed have some good ideas.

BigTable

The distributed high performance database system that plenty of Google's internal and external tools live on solves scalability and performance problems by intelligently distributing blocks of information across a sparse, distributed, multi-dimensional sorted map (like a giant excel spreadsheet!). Breaking that down to the nature of the cost of operations we discussed earlier – the better or more uniformly sorted a search space, the less overheads required to pull information from it.

MapReduce

Computationally, there are some functions that help speed up the whole interaction between us (information hungry searchers) and the search engine. Two such core functions are map, and reduce. MapReduce, named with stunning originality and inspiration, is a framework for processing extremely large datasets on many distributed computers (nodes). The map step takes input to the master node, slices it up into smaller sub problems and distributes it to worker nodes.

One might not be able to reduce the computational complexity, but we can most definitely distribute it...

These pass back to the master node when complete. The reduce step takes the answers from all these nodes, and combines them to find some solution.

This isn't a glamorous or wildly innovative concept. Cluster computing has done this for many years now. It just so happens that when searching for an answer to a search, looking through millions of web pages in a cache was a new and novel use for distributed computing, in this way. The core advantage is being parallelism. One might not be able to reduce the computational complexity, but we can most definitely distribute it, to keep the adage "Many hands make light work" valid.

Searching is a complex game, as we hope you can now appreciate a little more. We take it for granted. All those CPUs working in conjunction to bring you accurate, targeted and relevant results don't take it lightly however. On that note, it seems relatively certain that the CPU vendor giants are onto the right track with their super high-density core designs, with such scalability requirements in projects these days. Many would argue that the social media generation is driving hardware innovation and industry futures, but the truth might be that it's the pure thirst for information that's keeping all those cores warm. **JC**

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I/O OF THE MONTH

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Every time I want to print a photo, my Stylus Photo has at least three blocked nozzles. The unblock routine sometimes works first try, but usually needs a couple, and apparently it works by just pissing ink into a little sponge inside the printer. This is not just annoying but also really expensive.

Now I haven't printed any photos for a couple of hot months, and it looks as if there are more blocked nozzles than unblocked. I did a couple of clean cycles, but at this rate I'll have to use a whole set of cartridges to clean it out. And apparently there's no guarantee even then.

Is there any other way to do this? Preferably one that involves some cleaning substance cheaper than Grange Hermitage?

Logan Gosse

Yes, it is possible to clean printer nozzles with something other than staggeringly expensive ink. You probably won't even screw up your printer. Window-cleaner with ammonia in it can do the job, and the procedure is generally simple:

1: Get the head out where you can work on it, with a sponge or paper towel under it.
2: Remove the cartridges.
3: Dribble your Windex-or-whatever through the head assembly, or even squirt *small* amounts of cleaner in with a syringe.
4: Remove colourful paper towel, replace cartridges, power up printer, hope for the best.

(All usual disclaimers apply here, of course. There are several ways to break a printer by doing this. The management disclaims all responsibility.)

The exact technique for different models of printer varies, but this routine is now well enough known that you can find discussions about it for many different models – just searching for the printer name and 'windex' often does the trick. There are even techniques to use with inkjet printers that have cartridges that incorporate the print head, which can still block before you use all of the ink.

Clean your printer, and get a free psychedelic Rorschach test!

Core wars

How do I make a program only use a particular CPU or group of CPUs, without using Task Manager?

The Witcher kept crashing, and after dicking around with the graphics settings didn't help, I thought of setting the game process to only use one CPU (of the 8 'CPUs' I have on a 4-core i7 with Hyper-Threading). 'Set Affinity' in Task Manager (Windows 7, 64-bit) let me do that, and that fixed it! I think!

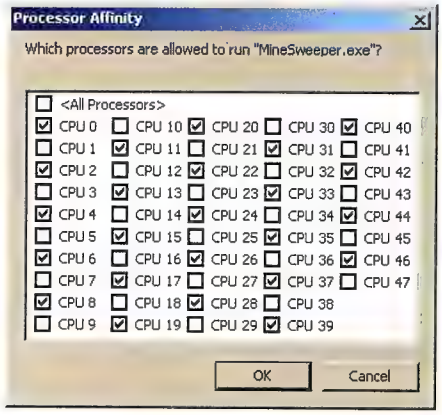
But the game supports multithreading, so I tried giving it two CPUs to use, and that seems okay too. I think it just freaks out if it gets ALL of the CPUs.

I looked on microsoft.com and found there's a utility, 'imagecfg', that lets you modify an executable to only run on particular CPUs. But if I do that I bet game updates will fail. And if I stick with Task Manager, I have to re-set the affinity every time I run the game.

Can't I just automate whatever it is that Task Manager does when you Set Affinity?

Alex Franki

Standalone utilities that let you set the priority and affinity of particular processes whenever you run them exist, but you can also just use the command-line START command.



Among START's numerous options (open a command window and type 'start /?' to see them all) is affinity-setting. If you want to restrict, say, Notepad to only run on CPU 2, you could type

```
start /affinity 4 c:\windows\notepad
```

To make this a point-and-click operation, you'd make a shortcut to the program you want to run, then go to the shortcut's properties and change the 'target' line to have start /affinity et cetera at the beginning of it. (Remember to put quotes around the target statement when there are spaces in it.)

The only tricky part of this is why CPU 2 equals /affinity 4. It's because the number you put there is actually hexadecimal – the hex value of a 'binary mask' that identifies each CPU.

Which is, fortunately, not as complicated as it sounds.

If you've got a Hyper-Threaded four-core CPU, your computer does indeed think you've got eight CPUs, numbered 0 to 7 (because computers usually start counting at zero). Each of those CPUs gets one digit of the eight-digit binary mask number, CPU 0 getting the least-significant bit at the right and CPU 7 getting most-significant at the left. So if you wanted a task to run on CPUs 0, 1 and 5, the mask would be 00010011.

You can convert binary, decimal and hex numbers in many automated ways (Google will do it for you using the '0b' and '0x' prefixes to indicate binary and hex). It's a good idea to do it by hand a couple of times, though, if base-2 and base-16 are not yet familiar to you.

In decimal the rightmost number indicates units, the next one tens, then hundreds, and so on, with digits 0 through 9 allowed. In binary it's units, twos, fours, eights and so on, with only zeroes and ones. In hex it's units, 16s, 256s and so on, with digits 0 through F. So binary 10011 (0b10011, to avoid confusion with decimal ten thousand and eleven) is one unit, one two, and one 16, for a total of 19 in decimal. 19-decimal is three units plus one 16 in hex, or '13' (0x13, to avoid confusion with decimal thirteen). So to set a program's affinity to those CPUs you'd type start /affinity 13 [program].

It's harmless to run Notepad over and over with different affinities, so you can just experiment with the command line until you get a handle on the mask idea.

Note that Hyper-Threading turns each physical CPU core into two virtual CPUs. 'CPUs' 0 and 1 are both on the first physical core, CPUs 2 and 3 are the next one, and so on – which is why you're counting to 7 for a four-core CPU. If you set a multithreaded process's affinity to 'CPUs' 2 and 3, it may run faster than it would on only one 'CPU', but to get the full benefit you need to spread the process across more than one physical core, by telling it to use CPUs 2 and 4, for instance.

(This also means that if you're setting process affinity so that, for instance, a couple of CPU-intensive single-threaded tasks can be confined to one CPU each, you won't get much benefit if you assign them to two CPUs that are both actually the same core.)

Just use a nail gun

I'm building a new PC in this awesome server case I found in the 'old broken junk' room at work. It has a ton of 5.25 bays, which I'll put hard drives into with adapter rails, and there's a bay for some sort of redundant power supply that an ATX PSU roughly fits. The back panel should be useable, too; I'll just drill and hacksaw holes wherever they're needed.

Motherboard mounting is a problem, though. The case used to have some giant Alpha or something board in it, and there are round metal standoffs that seem to be welded in place, that don't line up with ATX mobo mounting holes at all.

I'm wondering whether I should angle-grind the standoffs away and drill new holes for standard hexagonal PC standoffs. I'd have to be pretty accurate with the drilling, though. Could I just put a sheet of plastic or something over the standoffs and fix the mobo onto that? Would this cause earthing problems?

I'm not planning to carry this computer to LAN parties or anything (MUCH too heavy), so a mobo mount that's a bit wonky and wobbly would be alright. What would you do?

Mitchell Deakin

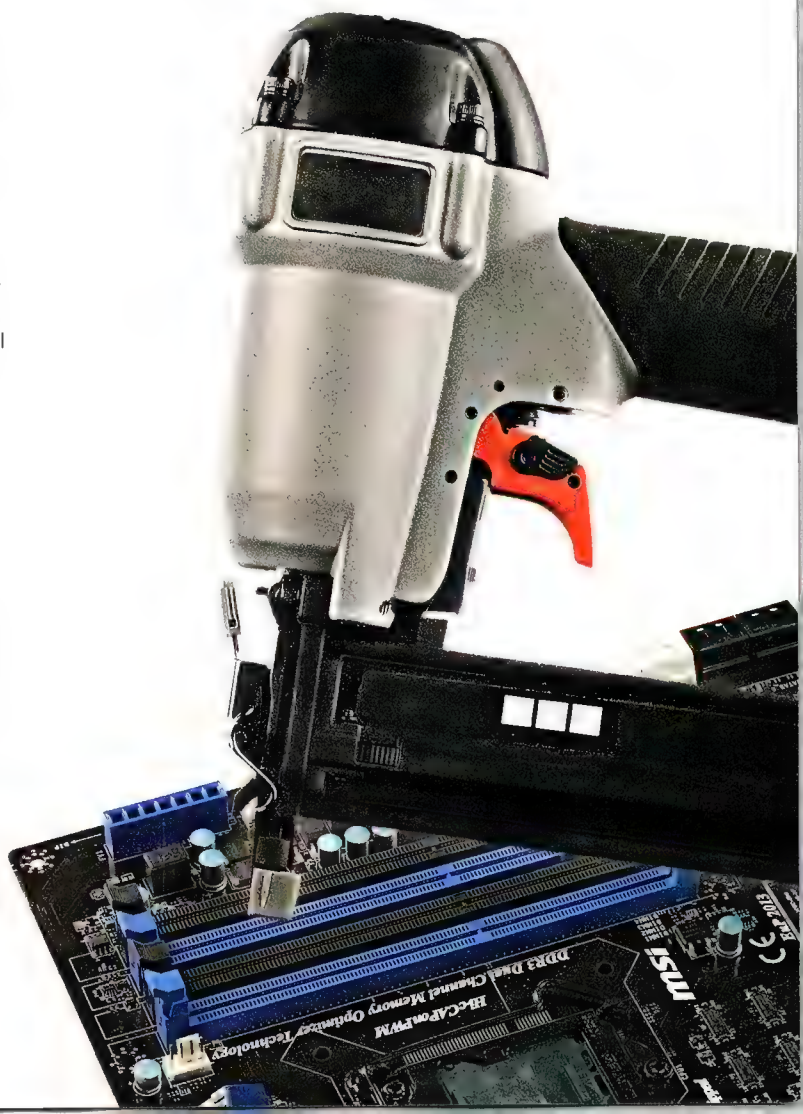
The motherboard does need to be earthed, but this isn't a big problem - if the PSU and expansion card brackets are in contact with the chassis, that ought to do it. You could easily wire a unused mounting-screw spot to a point on the chassis as well, if you liked. (Use of automotive 2-gauge braided-copper earth strapping is optional.)

Apart from this, all your mounting method has to do is line up the mobo with the back of the case, not interfere with anything sticking out of the back of the board (like the CPU mounting frame), and prevent the back of the motherboard from touching the chassis so that random solder pads short to ground.

All sorts of improbable-sounding ideas would work. Yes, some non-conductive sheet attached to the existing mounts and to the mobo. Or a wooden frame. Or even a scribble of construction adhesive, if you never intended to *remove* the mobo again.

I'm tempted to suggest polycaprolactone plastic as a universal replacement for all sorts of plastic clips and knobs and standoffs. At room temperature it's like white nylon, but at about 60°C it becomes a clear, sticky substance that you can mould like Blu-Tack, and reuse indefinitely. You can buy it under the name "Polymorph" from Jaycar, and I rambled on about it here: **bit.ly/oddplastic**

That low melting point means polycaprolactone could turn back into clear goop in a hot PC, though. It'd be okay for side brackets for a motherboard in a decently-ventilated case, but questionable as a standoff near the CPU.



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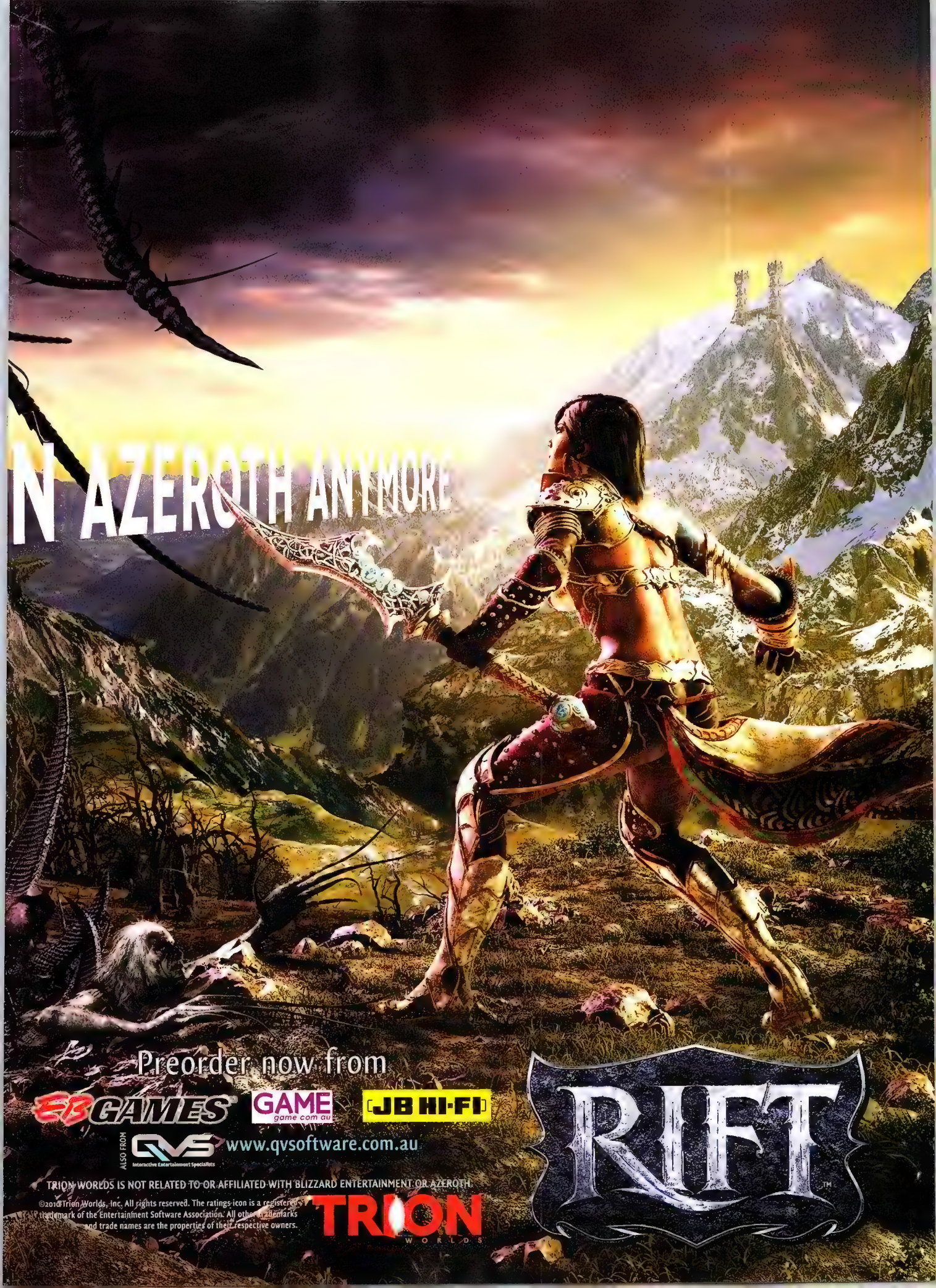
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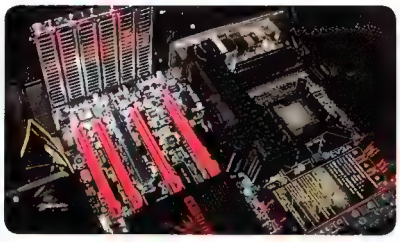

Growing pains

The great New PC project continues apace...

There always seems to be at least one stumbling block with a new PC build (see last issue's TechO for specs). This time it started with a little underestimation of size.

While I had meticulously planned out the position of the cards on the Classified 3, and made sure everything fit within the Raven RV02E case, when it came to the soundcard – an Auzentech HTHD – I somehow missed it that it was longer than the available space in the single PCI-E 1x slot where I planned to put it. The problem was the Classified 3's NB cooler – a long, towering affair with a slight protruding extension – and where a standard X-Fi would fit, and thus I had assumed the HTHD would also, it turned out it was a few centimeters too long, something I found only as I was assembling for the first time. That little outcropping on the heatsink was blocking it (insert fist shaking at EVGA – why artificially limit a slot when the heatsink is big enough? I digress).

I *could* move it to a PCI-E 16x slot, in between my two GTX 580s, but I was planning to keep this free for when I go Surround and need a third card to drive 5760 x 1200 at any reasonable rate. Plus, it'd lower one of the cards to 8x, though in practice this is only a real issue for resolutions of 2560-plus. Mostly, though, it'd leave that PCI-E 1x free and, dang it, that's where I had decided the card would go when I chose the board.

So there was only one thing for it: cull the heatsink. The extension that was causing the blockage is fortunately only a small part of it, so shouldn't hamper dissipation much, and given EVGA expects builders to disassemble the cooler for use with water cooling, it was a cinch to remove.

I don't usually do hardware mods; I don't even have a dremel! So after a quick hacksaw adventure and generous use of a key-cutting sander at the local hardware store to smooth out the bumps, I had a straight NB cooler that didn't block the card. Win!

Serendipitously, the RAM cooler that came with my G.Skill DDR3-2000, which I discovered wasn't really necessary given the Raven's bottom case fans blow directly over the RAM slots, turned out to fit perfectly on top of the EVGA NB cooler, dropping temps by ten degrees on the chip (and looking just a *tad* snazzy through the case window too).

...insert fist shaking at EVGA – why artificially limit a slot when the heatsink is big enough?

This was but the first stumbling block though. After spending about five evenings finding the highest BCLK for each RAM divider to maximise this puppy (ended up with 4.2GHz on the CPU for the 980X and a decent 18.5GB/s read and 42.5ns access for RAM in AIDA64) I went to actually bench and game, where I found rather disappointingly that levels would load faster on my old system, using Raptors in RAID, over my new C300 SSDs in RAID. It defied all logic, and after trying a *great* many elementary deductions it turned out to be caused by C1E being enabled in the BIOS. Bad idle power saver, bad!

Then there was the strange problem of the HTHD only outputting two-channel sound regardless of driver settings. I even moved it between the GTX580s as a last resort, should it be an IRQ issue, but no go. In the end, out of a sneaking suspicion that the two-channel output that was also plagued with odd volume spikes that sounded like a feedback loop, I pulled the Intel HD/AC97 cables from the back that I had attached to hook it up to the case headphone/mic ports. Bingo, problem solved. Said cables have now been banished to the Drawer That Is Never To Be Opened as punishment (granted, it's the soundcard that's at fault for this, but now it works, so...)

So here I sit, my new precious humming happily close by. It's zippy and fast (benching P47k in Vantage, P11k in 3DMark11, before OCing the 580s) and it gives me a beaming smile when I boot it up. There were a few other growing pains, like how I lost two cores when booting Linux before I realised I had built my custom kernel to max on four – which shows how little I expected six cores to come by – but otherwise I have that proud new parent glow!

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Inside the Smartphone

In a relatively short time, smartphones have gone from being cumbersome niche devices to ubiquitous pocket computers that do everything. **Gareth Halfacree** looks at the technology involved.

Smartphones have become a part of everyday life. Whether it's Apple's iPhone, a RIM BlackBerry, one of the rapidly growing numbers of devices based on Google's Android platform, or a Windows Mobile handset, the chances are that you have one in your pocket right now. Equally likely is the fact that a few short years ago your mobile, if you even had one, was as dumb as a box of rocks. What triggered the sudden growth of the smartphone from niche product to ubiquitous computing accessory?

The history of the smartphone goes back further than you might think, with the first device to hit the market dating way back to 1992. The Simon Personal Communicator, developed by IBM in 1992 and brought to market by BellSouth in 1994, combined the functionality of a PDA with a mobile, and included pre-loaded apps offering a calendar, address book, world clock, calculator, note-taking facility, several games, and even rudimentary support for email and faxes. Sadly, its $900 price tag and basic display didn't prove much of a hit in the market.

The Simon was followed by a raft of successors, including Nokia's Communicator series, but the user experience often left a lot to be desired. Typically bulky, cramming physical QWERTY keyboards into an already cramped form factor, the majority of smartphone devices weren't the easiest to use. Smartphones that did feature a touch-screen usually required the use of a stylus, making them awkward to use and fuelling a profitable industry in replacing broken or lost styli. Poor functionality from built-in software also meant that the devices weren't popular outside of the bleeding-edge technical community and the must-have yuppie market.

In the last few years, however, the technology behind smartphones has advanced in leaps and bounds. Portable processor speeds and memory capacities have increased to the point where smartphones are capable of running applications that are just as complicated as those on the average laptop or netbook. Improvements in display technologies mean that high-resolution entertainment is a given wherever you might be, but these elements alone don't explain the massive growth in the market over a surprisingly short period of time.

The sudden growth of the smartphone market has seen the devices grow from being a niche product to comprising around a third of all mobile handsets sold worldwide, in a period of less than five years. This sudden growth is attributable to a pair of technologies: ubiquitous high-speed mobile broadband and capacitive touch-screens.

Although early 'smart' phones were mostly offline devices, modern smartphones rely heavily on data communications and Internet access to make them easier to use. From access to social networking, cloud-based address books, and push messaging technologies, a smartphone isn't nearly as clever when its connection to the Internet is severed.

The growth of high-speed mobile networking, which started with the introduction of the GPRS standard in 1998, means that modern smartphones are able to rely on a constantly activated, high-speed connection to external networks, including the Internet. These

Capacitive versus resistive touch-screens

One of the biggest features of a modern smartphone is its touch-screen display, but varying technologies lead to a vastly different user experience depending on the device used.

Resistive touch-screens usually take the form of a pair of sheets that, when pressed together, alters the voltage travelling through those points. This change in voltage is then used to plot both X and Y coordinates.

With their fast response times and extremely high resolutions, resistive touch-screens are most commonly used with a blunt-tipped stylus, but you can use something similar. Although originally only available as a single-touch input device, recent advances in resistive touch-screens have allowed basic multi-touch support to be included too. If a smartphone includes a stylus, it's almost certainly a resistive touch-screen.

Capacitive touch-screens use an insulating panel, which is typically glass, coated with a transparent conductor such as indium-tin-oxide. When the coated display is touched by something conductive, such as a finger, a change in capacitance allows the location of the interaction to be calculated. Capacitive touch-screens often provide a smoother experience for bare-finger use than resistive touch-screens, as they don't require any pressure to operate. However, they only work with capacitive surfaces, so you can't wear gloves, for example. Most modern smartphones use a capacitive touch-

The history of ARM

ARM architecture has been fundamental in the development of modern smartphones, accounting for most processors in the market, but where did it come from? We delve into the history of ARM.

1983

Work on the Acorn RISC Machine architecture begins with a BBC Basic simulation created by engineer Sophie Wilson. The simulation demonstrates to chief executive Hermann Hauser that the creation of a competitive 32-bit processor would be feasible for the small company.

1985

A hardware version of the Acorn RISC Machine processor is completed, and added to Acorn's BBC Micro system as a second processor to speed up development of the supporting chipset.

1986

The first commercial ARM processor, based around version two of the architecture, is released. This finds its way into the heart of the company's Acorn Archimeades microcomputers, running at 8MHz. A special operating system, dubbed RiscOS, is developed for the chip.

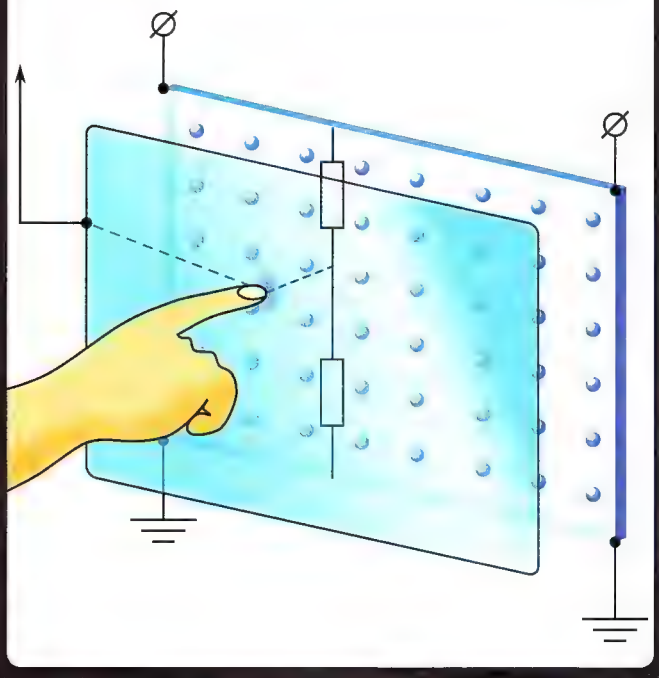
1991

Processors based around the third-generation ARM architecture, now known as Advanced RISC Machines and owned by ARM Holdings, appear in the first of many portable ARM-powered devices, including the Psion Series 5 and Apple's Newton handhelds, with speeds reaching 33MHz.

1996

ARM releases version 4, called ARM7TDMI. The addition of a three-stage pipeline, support for the Thumb instruction set, more cache and a low power draw makes it popular with portable device manufacturers. This and the associated StrongARM processor appear in Nintendo's Game Boy Advance and DS consoles, Psion's Revo handheld and Apple's iPod.

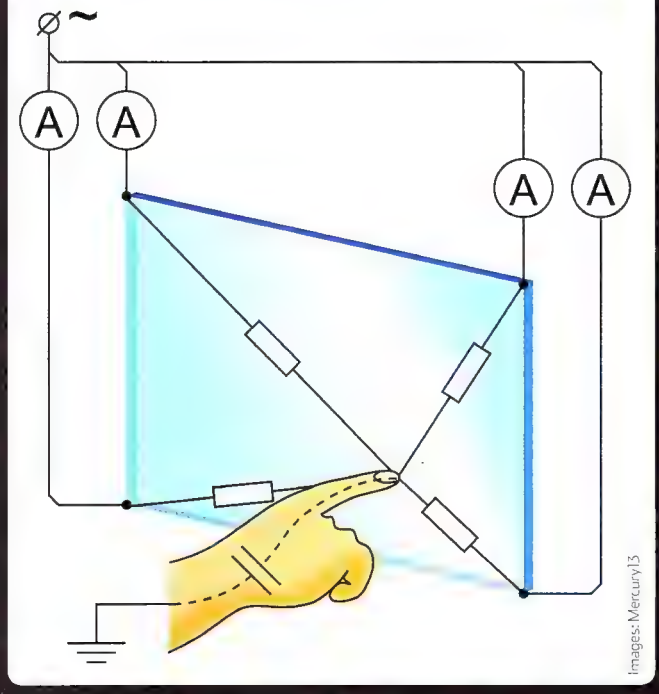
Resistive touch-screen



screen, and are operated without a stylus.

The battle between resistive and capacitive touch-screens has been fierce, but more interesting than that is the cutting-edge technology that may replace both. Paris-based Sensitive Object announced its Anywhere MultiTouch system back in 2009.

Capacitive touch-screen



Images: Mercury13

Designed to use piezoelectric sensors to pick up vibrations from a stylus or fingertip, the Anywhere MultiTouch can detect multiple contact points across the entire casing of a device, rather than just the display. So far, however, the company hasn't announced any commercially available products based on the technology.

1999

ARM's domination of the mobile market begins in earnest with the fifth generation. The ARM9E brings updated Thumb support, improved signal processing instructions and support for Jazelle DBX Java hardware acceleration. It appears in handsets from Sony Ericsson, Siemens, and BenQ. The XScale variant is used in palmtops, including Dell's Axim series.

2001

The sixth generation of the ARM architecture is used to produce the ARM11 design, which immediately becomes a huge success. The design is taken up by smartphone manufacturers including Nokia, HTC, Motorola, Samsung, Sony Ericsson and ZTE, and appears in Apple's incredibly popular iPhone.

2005

The seventh-generation Cortex-A8 is announced. This processor scales from 600MHz to 1GHz and beyond and appears in the iPhone 3GS, Palm Pre, Motorola Milestone, Samsung Wave, Sony Ericsson Satio, Nokia N900 and Apple's iPad tablet. Linley Group researchers release a report claiming that 98 per cent of all mobile phones use at least one ARM processor.

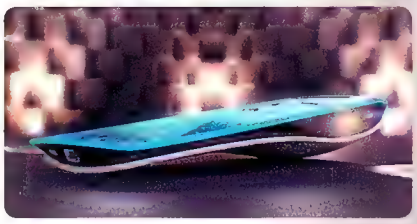
2008

ARM announces that its licensees have shipped more than ten billion processors since the ARM6 in 1991, with chief executive Warren East pointing out that 'ARM partners have now shipped more than one processor for every single person on the planet'. Partners continue to ship around three billion ARM processors every year.

2010

Continuing its market dominance despite growing interest from Intel, ARM adds hardware virtualisation, long physical address extension support and multi-processor cluster coherency, developing the Cortex-A15 2.5GHz processor. Many see the new chip as the start of ARM's move back into the desktop and server market. The design, however, remains 32-bit.

Mozilla Seabird



Created as part of the Mozilla Labs Concept Series by engineer Billy May and refined by feedback from the Mozilla community, the Seabird is described by its creator as "an experiment in how users might interact with their mobile content as devices and technology advances".

Following the rapid performance enhancements enjoyed by smartphones, with memory capacity and CPU speed eclipsing that of desktop computers of just a few short years ago, May worked to create a system that would concentrate on the area in which smartphones are still lacking – user input.

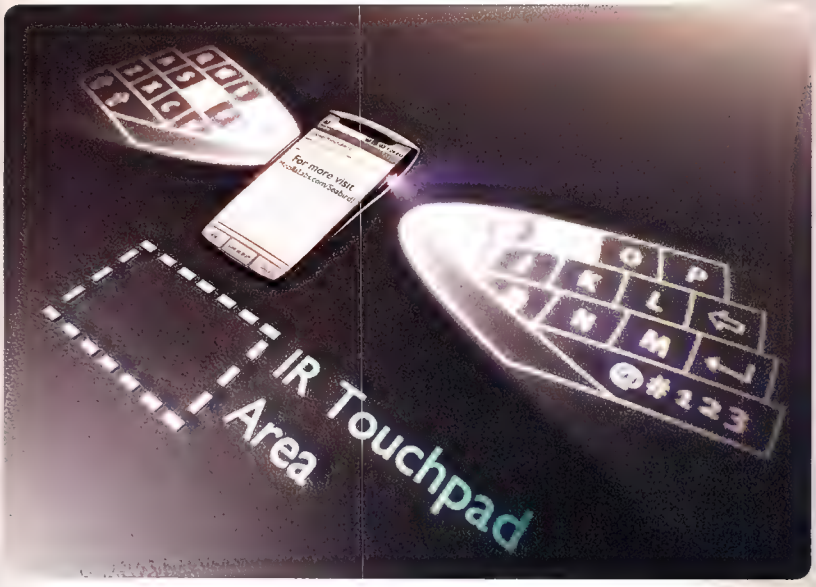
The Seabird features integral projectors and sensors that allow any surface to be used as a text-entry keyboard or trackpad, greatly improving usability over a cramped physical or on-screen virtual keyboard. A removable Bluetooth headset also doubles as a mid-air pointing device, allowing the user to pan across a three-dimensional user interface with physical gestures.

Combined with a dock, the Seabird can even replace a netbook as your portable device, using a pico-projector to create a high-resolution display on any available wall, along with in-built projectors to turn a table into a full QWERTY keyboard.

While it might seem a little farfetched, the technologies behind the Seabird concept aren't science fiction and devices with similar capabilities already exist in the market. The Samsung Galaxy Beam, for example, includes an integral pico-projector, while the Celluon Virtual Laser Keyboard connects to a smartphone via Bluetooth, and the Nintendo WiiMote is a comparable input device to Seabird's headset. The Seabird differs in that it combines these disparate technologies into a single device.

Sadly, the Seabird remains a concept – a mere glimpse of where current research could lead us. Mozilla, for its part, has denied any plans to bring the device to market, or indeed to create its own smartphone at all.

Poo.



can remain active in the background while only charging the user for the amount of data actively transmitted or received. As networks have moved into 3G and 4G technologies, the speed of connection offered to smartphones has rapidly increased – future technologies could scale to the gigabit level and beyond.

The prevalence of high-speed networking is one of the main driving forces behind the rapid growth of smartphones. Without the backing of high-speed mobile broadband technologies, many of the features that have come to be associated with smartphones wouldn't be possible. To put it in perspective, would you have bought your most recent smartphone if it didn't include a web browser that allows you to access your favourite websites while you're on the move?

As the Web has grown in complexity, and consumers have come to expect higher-resolution images and more streaming media, portable devices have had to accommodate that demand. It's no good having a device that's capable of viewing streaming video at high resolutions in your pocket if the network to which it's connected is too slow to transfer the data.

The increase in high-speed mobile broadband networks has also boosted the growth of the smartphone, with developments in one market directly driving the other. As more users demanded mobile data on their handsets, networks were forced to develop technologies to provide high speeds. Subsequently, as high speed-networks became ubiquitous and affordable, more people started opting for smartphones on their next handset purchase.

The other major driving force behind the sudden explosion in smartphone sales is the capacitive touch-screen. Unlike earlier versions, which were based around resistive technology, capacitive touch-screens require no pressure in order to operate. The simple swipe of a finger is enough to activate the sensors built in to the display, making capacitive touch-screen devices far easier to use than earlier resistive models.

The Apple's iPhone's multi-touch capacitive touch-screen meant that users could use gestures such as pinch-to-zoom in order to interact with the device, and sales sky-rocketed. The disadvantages of the capacitive design, such as the inability to use gloves and the lack of a stylus for high-accuracy work, were more than outweighed by the sheer ease of use that the design allowed. The success of the iPhone pushed other smartphone manufacturers to ditch resistive touch-screens in favour of the new capacitive design, and it has become the most prevalent input method for modern smartphones.

Even holdouts such as Research In Motion, which has traditionally eschewed touch-screens in favour of keyboards and a trackball-style roller beneath the display, have admitted defeat and started to implement capacitive touch-screens in their designs. In RIM's case, the BlackBerry Torch 9800, released last year, was the company's first touch-screen device and incorporated a touch-sensitive display on a slider mechanism

that unveils a more traditional physical BlackBerry keypad underneath.

While the technology behind the hardware of a modern smartphone is pretty standard, there's a far wider variety in software, and each camp has its own fan base.

Nokia's Symbian OS was one of the first smartphone operating systems around, and still accounts for the vast majority of handsets in the market. Although it has recently had a few setbacks, with several manufacturers leaving Symbian in favour of Google's Android, figures still show Symbian as holding the lead with just over 40 per cent of the market. Sadly, the platform is looking a little clunky, and early reviews of the N8, the first handset to run Nokia's re-built Symbian^3, don't look promising.

BlackBerry OS, from Research in Motion, is the next biggest shareholder, accounting for around 18 per cent of the smartphone market. Its ubiquitous nature in business certainly helped, while its position as the first platform to offer push email functionality helped the platform to achieve its current status. Now, however, times look hard: Research in Motion is concentrating on a new platform based on real-time operating system QNX, which will first hit the market in the company's BlackBerry PlayBook tablet device. RIM has confirmed plans to ditch BlackBerry OS altogether, with future devices sharing the same platform as the PlayBook. It's a risky move, but it means that developers will be able to produce apps that run on both BlackBerry smartphones and the PlayBook tablet, just as with the iPhone and iPad.

Meanwhile, Google's Android has been one of the biggest success stories in the smartphone market so far. Launched in 2008, the open-source platform has gained massive traction in the market, much of which has been at the cost of Nokia's Symbian OS. The latest figures show Android sitting in third place in the smartphone market, holding an impressive 16.3 per cent. The fact that Google licenses its platform to third parties has helped it to rapidly catch up to and surpass Apple's iOS. Many people complain at the fragmentation of the market, however, with updates often slow to appear from some manufacturers.

Apple's iPhone operating system, following a slowdown in sales, sits in fourth place. Enjoying massive interest at launch, iOS has become significantly less popular since the appearance of Google's Android, but still offers a rich user interface and some very polished technologies. By locking the platform to its own hardware only – much like Mac OS X on the desktop – Apple has ensured that the fragmentation and compatibility issues that Android has experienced are bypassed, but at the cost of less opportunities for growth.

Microsoft's Windows Mobile, once a leading light in the smartphone market, is currently languishing with a mere 6.8

Communications Technologies

We've all heard of 2G, 3G and 4G networks – but what exactly is the distinction between the various generations?

0G The original mobile network, first deployed in Japan in 1979. Although data connections were supported, the use of analogue modems and the poor audio quality meant that speeds were limited to 2.4Kb/s.

1G The first digital mobile network, launched in 1985 by Vodafone. Although the analogue system had been replaced by something more recognisable by modern standards, data traffic still wasn't considered a major selling point and speeds remained extremely slow.

2G The birth of the second-generation mobile networks, switched on in 1991, brought usable digital data transmission to market for the first time. The circuit-switched networks, which were billed per minute, allowed speeds of up to 9.6Kb/sec. The creation of the High-Speed Circuit Switched Data standard would improve this to an impressive 38.4Kb/sec.

2.5G GPRS offers an alternative to the High-Speed Circuit Switched Data standard and, while speeds aren't improved, networks are able to keep the connection open without tying up hardware. The result? The first per-kilobyte billing system for mobile data transmission.

3G The EDGE, or Enhanced Data rates for GSM Evolution, standard brought high-speed mobile broadband for the first time in 2000. Generally recognised as the first widely deployed 3G standard, EDGE offers speeds of up to 236.8Kb/sec through the introduction of high-order PSK/8 phase shift keying.

3.5G The fifth release of the 3GPP standard ratified HSPA, a pair of upstream and downstream speed-boosting technologies. While there are ways to increase the speed, the technology still suffers from high latency.

3.9G Long Term Evolution was originally slated to be the first 4G technology, but a failure to fully comply with competing WiMAX standards meant that LTW was downgraded to 3.9G status. Despite the setback, LTE represents a significant advancement over 3.5G networks, with speeds of up to 100Mb/sec downstream and 50Mb/sec upstream promised.

4G Still in development, the first standard to win the race to 4G certification looks to be LTE Advanced. Details are still scarce, but early testing by Japanese mobile network NTT DoCoMO revealed that the technology could transmit data at a rate of 5Gb/sec to a client device travelling away from the transmitter at speeds of up to 10kmph.

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iPhone 4

Like it or loathe it, there's no ignoring Apple's latest smartphone, the iPhone 4. Improving on predecessors in almost every way, it's a technological marvel – but it hasn't been without its growing pains.

Manufactured by Foxconn, the iPhone 4's main feature is its 3.5in 960 x 640 display. The resolution is one of the highest available on any portable device, managing up to 326 pixels per inch, pushing Apple to brand it a 'retina display' and claim that the resolution exceeds that of the human eye.

Behind the screen is Apple's custom-built A4 processor, which also appears in the iPad tablet. Based on the ARM Cortex-A8 design, the A4 processor runs at speeds of up to 1GHz and provides a far faster experience than the company's previous smartphone, the iPhone 3GS.

The high-performance ARM CPU, coupled with a PowerVR SGX graphics chipset and 512MB of eDRAM, means that the iPhone 4 is undeniably powerful, but users have still experienced some irritating glitches since its launch.

Most famously, the iPhone 4's new antenna design, which uses an exposed metal border around the edge of the device as the antenna, can cause the signal to drop if held in a certain way. While a software patch that changed how the operating system displayed signal strength information helped, many still claim that Apple's 'Antennagate' is a problem. Steve Jobs' comments that the problem could be resolved if users "avoid holding it that way" certainly didn't help.

Despite this, the iPhone 4 has proved extremely successful, selling more than 14.1 million handsets so far.

The ability to customise your experience with downloadable applications, missing from early smartphones, has been a major factor driving the success of the devices, allowing different users to tailor the same handset to their needs. Developers, however, still need to compete with multiple ecosystems based around conflicting technologies; whereas a developer for Apple iOS platform needs to write in Objective C, someone working on an app for Google's Android platform would instead write in Java.

The massive growth of the smartphone proves that users want an all-in-one device that they can have with them at all times and, assuming that tablets don't kill the smartphone market off, there are some exciting developments on the horizon. Concept devices such as Mozilla's Seabird, combined with next-generation mobile broadband technologies, will mean that future smartphones are another breed entirely.

Let's just hope the networks have sorted sensible per-megabyte costings by then.

percent of the market. The lack of a decent centralised application repository, combined with an outdated user interface has left the platform struggling against competitors. Microsoft is working on this, however, and with Windows Phone 7 replacing the Windows Mobile platform, Microsoft might finally be back in the game.

As well as being driven by increasing technology in the touch-screen and mobile broadband market, the smartphone has even developed a new sector of its own: application sales. While smartphones have supported the installation of third-party applications for years, it again took the launch of Apple's iPhone to turn a neat feature into a thriving market.

When Apple launched the iPhone, it also launched a dedicated online shop, with both free and paid-for third-party applications, for the device: the App Store. Since then, the App Store has grown to encompass more than 300,000 applications – and with Apple taking a cut of the sales from each app listed on the site, it's proven a nice little money maker too.

Since the launch of the App Store, other companies have tried to emulate its success: Google's Android platform has the Market, which holds more than 80,000 applications, while Microsoft's recently launched Windows Phone 7 has its own app download service.

Windows Phone 7

Microsoft's overhaul of the Windows Mobile series, complete with new name, has just hit the streets. Handsets include the Samsung Omnia and the HTC Mozart 7, and it brings with it a vastly different experience to that of its predecessors.

Based around the concept of hubs, the customisable user interface shipping with Windows Phone 7 is designed to give users access to their most commonly used features as quickly as possible, and includes heavy integration with social networking services such as Facebook and Twitter.

Microsoft appears to be trying to appeal to all possible markets. Windows Phone 7 offers the functionality expected of a business-orientated handset, such as support for MS Exchange servers, as well as bringing the platform under its Xbox Live gaming platform. With Windows Phone 7, users are able to play games – developed using the company's XNA platform, as with Xbox Live Arcade titles – in which they can earn achievements and Gamerscore points, while logged on to the same GamerTag as they use for their Xbox Live account.

With the iPhone making serious waves in the mobile gaming market, it's a smart move by Microsoft, and with some big names already signed up to the platform, including Electronic Arts, it could be the killer feature that spells an end to the company's bad fortunes in the mobile sector.

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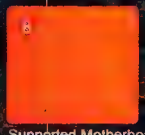

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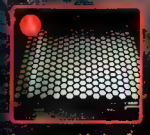
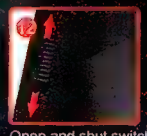


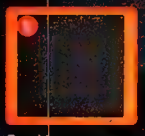
Large vent holes for PSU installed at bottom of case for great air flow

Squeeze and pull HDD tray

Pre-drilled water pipe holes with one of them for USB3.0 cable



Open and shut switch for the top ventilation



Provide easy access to CPU cooler's back plate

Dust filter for the bottom vent holes

Front air intake 23cm fan with Orange LEDs

Region	Distributor	Website link
SA.	Leader Computers P/L	www.leadersystems.com.au
WA.	DMA	www.dma.net.au
Vic.	SOFTLINE AUSTRALIA DISTRIBUTION PTY LTD	www.softline.com.au
QLD	XITD	www.xitd.com.au
NSW.	TA Electronics Pty Ltd	www.taelectronics.com.au

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HARDWARE

NEWS, REVIEWS AND ROUNDUPS ON THE LATEST HARDWARE

It only last month that we first took you deep into the world of Sandy Bridge – although you'll forgive us for thinking it feels like much, much longer, what with us being all old now (10 even!), and having sent that issue of the magazine to print sometime last decade. This month, we've got six more pages of Sandy Bridge fun to share with you all. Excited? You better be.

We've also had plenty of the newest tech on the block come through our labs this month, including a load of peripherals that have made us much, much happier than we thought they would.

There's also cases and motherboards and coolers and memory out the wahzoo – and, if you're not quite sure how to put it all together, even a whole system. Brilliant, yes?

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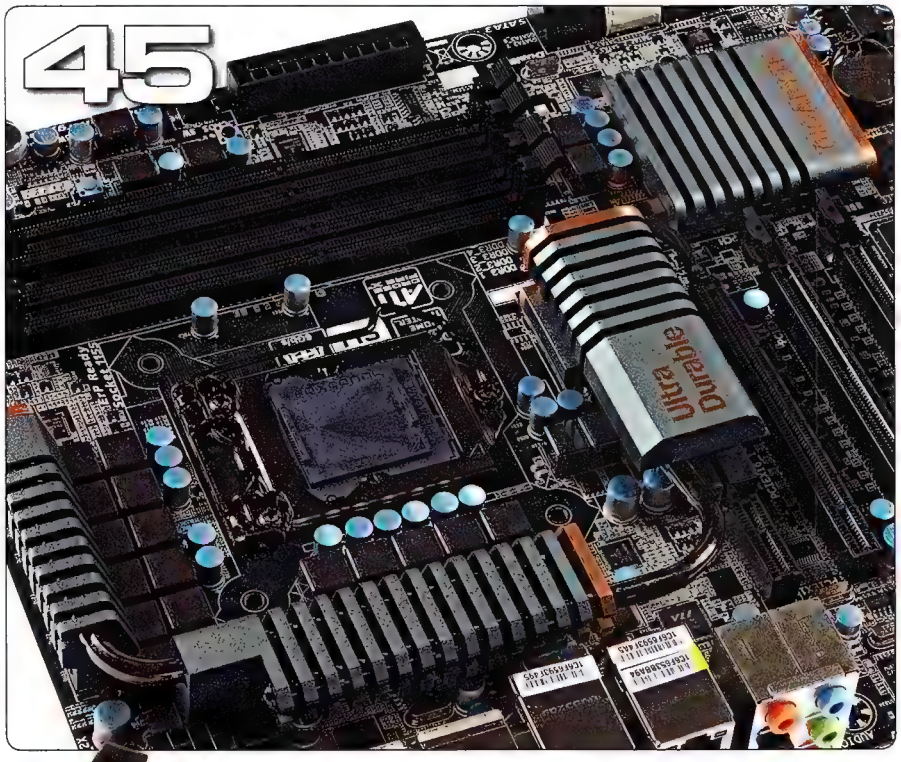


HOW WE TEST

We do a lot of testing in our labs, and we look long and hard at every piece of hardware to determine whether or not it passes muster. From taking a new card out of its packaging, to bundled extras, to performance, every facet of a given piece of kit's 'user experience' is under scrutiny.

In some instances, we have tough benchmarks to help us rate gear. For a CPU or a graphics card, raw performance is, of course, the most vital stat as whether it stinks or smells like roses, as well as the ability to overclock well. But there are other things we pay attention to in the review process.

Value for money is an important consideration, especially in the current financial climate. High end gear is expensive enough as it is, so we look for good bundles. For instance, a graphics card that comes with a game or two, all the cabling you'll need, and little surprises like tools and other bumpf will score higher than a card that costs similar, but doesn't give you any presents.

Build quality is another thing we rate. From a PC case to a motherboard, we like our hardware well-made and capable of a taking a bit of punishment. We also like any included manuals to be clear and concise.

A lot of what we look for can be hard to put into numbers, we admit, but we try to think about what any enthusiast would think about their new gear after laying down money for it, installing it, and then using it.

And our benchmarks help, too. We've picked a suite of games and applications that anyone can get access too, so that you – the reader – can easily compare your own gear with the kit we have in each issue. In fact, we'd recommend to all our readers that they run all of these tests on their systems and save the results, so you can always have a familiar benchmark of your own to compare to the latest gear in Atomic.

UNIGINE HEAVEN 2.1

Our test LAN: Getting a little long in the tooth, now, but we're soon to upgrade our entire in-office LAN. Watch this space!

CPU Benchmarks:

Hexus PiFast

http://pifast.hexus.net/pifast.php

PiFast is a program that essentially calculates pi to a set amount of decimal places. It is a single-threaded application (one core/thread) and we run it at ten million places (10, 000, 000) using the Chudnovsky method, in the standard mode with no compression, and a FFT length of 1024kb. The program is free, so grab it and run it on your CPU. Memory bandwidth plays a significant role in the final performance of this program, so be sure you bump up the frequency as well as the CPU clock!

wPrime

http://www.wprime.net/

"wPrime uses a recursive call of Newton's method for estimating functions", says the website as it attempts to explain in plain English what it does. What it does do is, essentially, complex square rooting and other number functions, which are able to be split up evenly between multiple cores, or simply run on a single core. We use wPrime 32M in both single and multi-threaded runs. The results of the single run are divided by the results of the multi run, and this gives us the efficiency of the CPU being tested – very useful knowledge to have when comparing chips and evaluating the benefits of overclocking.

Cinebench R10 x64

http://www.maxon.net/pages/download/cinebench_e.html

Cinebench is a stalwart benchmark, and is one of the more entertaining ones to watch. It focuses on rendering an image at 800 x 600 resolution, complete with ray-traced light effects and much more. It can be run in either singlethreaded or multithreaded mode, and efficiency is calculated the same way as for wPrime. The program also supports up to 16 threads in total, and even eight threads with Nehalem is an impressive sight to see. The difference in performance between 32- and 64-bit is minimal – just keep that in mind if your results for the same setup are slightly different.

Everest Ultimate Edition

http://www.lavalys.com/

Everest is a system information tool that monitors voltage, temperature, as well as reporting on a massive list of other areas of your system. Hardware and software are noted here, but perhaps the most useful part of this program is the memory benchmarks. Ready for the fastest of dual/tri-channel memory, this tests the read and write bandwidth as well as latency. The program is a small download, but keep in mind that you only get a thirty day trial until you purchase the full version – something recommended if you're into getting the most info about what your tech is up to.

GPU Benchmarks:

Crysis

http://www.ea.com/crysis/

Crysis is one of those games that can scale from Average Joe's rig all the way to the beastly Dream PC in Kitlog; but due to recent graphics card releases we needed to bump it up a notch. Our testing now uses a standardised timedemo run, with all settings on high at a resolution of 2560 x 1600. While we can't run any antialiasing at this res and still get playable framerates on most cards, it's still more than enough to really give cards the workout they truly deserve.

Lost Planet 2

http://www.lostplanet2game.com/

Lost Planet 2 from CAPCOM may not have been a big seller, but its technology is a great implementation of DirectX 11 in version 2.0 of Capcom's existing MT-Framework game engine. It forms part of the atomic benchmarking suite due to its use of tessellation and other features in an actual game setting. Our tests use the freely available benchmark version of Lost Planet 2 and are run fullscreen at 1920 x 1200 with 8x antialiasing and 8x anisotropic filtering. Tessellation is set to Maximum and all the other settings cranked right up. Results are given in frames per second

Unigine Heaven 2.1

http://unigine.com/products/heaven/

A synthetic benchmark built specifically to harness the latest and most demanding features of DirectX 11, Heaven is one of the best ways to test a card's tessellation capabilities. With a built-in timed run around a fully realised world, this benchmark taxes cards significantly and puts them under serious stresses. We test at a resolution of 1920 x 1200 using 8x MSAA and 8x AF, completing two runs of the built-in benchmark. The first run is with tessellation set to 'extreme'; the other 'none'. This highlights how well the cards can handle DirectX11 features and what they'll be like in a game that doesn't use the effect.

3D Mark 11

http://www.3dmark.com/3dmark11/

It really wasn't that long ago that we were introducing readers to 3DMark Vantage, but the relentless pace of hardware creep has led to a whole new benchmark, 3DMark11. Designed to measure a PC's gaming performance this latest version makes extensive use of all the new features in DirectX 11 including tessellation, compute shaders and multi-threading. We test using the Extreme preset, which runs at 1920 x 1080(p); this is designed to push even high-end systems, so we feel it's indicative of exactly the loads Atomicans expect from their gaming rigs.

LGA1155 Processors

In a nutshell, these new processors are amazing, and we've now had a lot more time with them...

Intel Core i5-2400 Price $240; Manufacturer www.intel.com; SKU number BX80623I52400
Intel Core i5-2500K Price $290; Manufacturer www.intel.com; SKU number BX80623I52500K
Intel Core i7-2600K Price $430; Manufacturer www.intel.com; SKU number BX80623I72600K

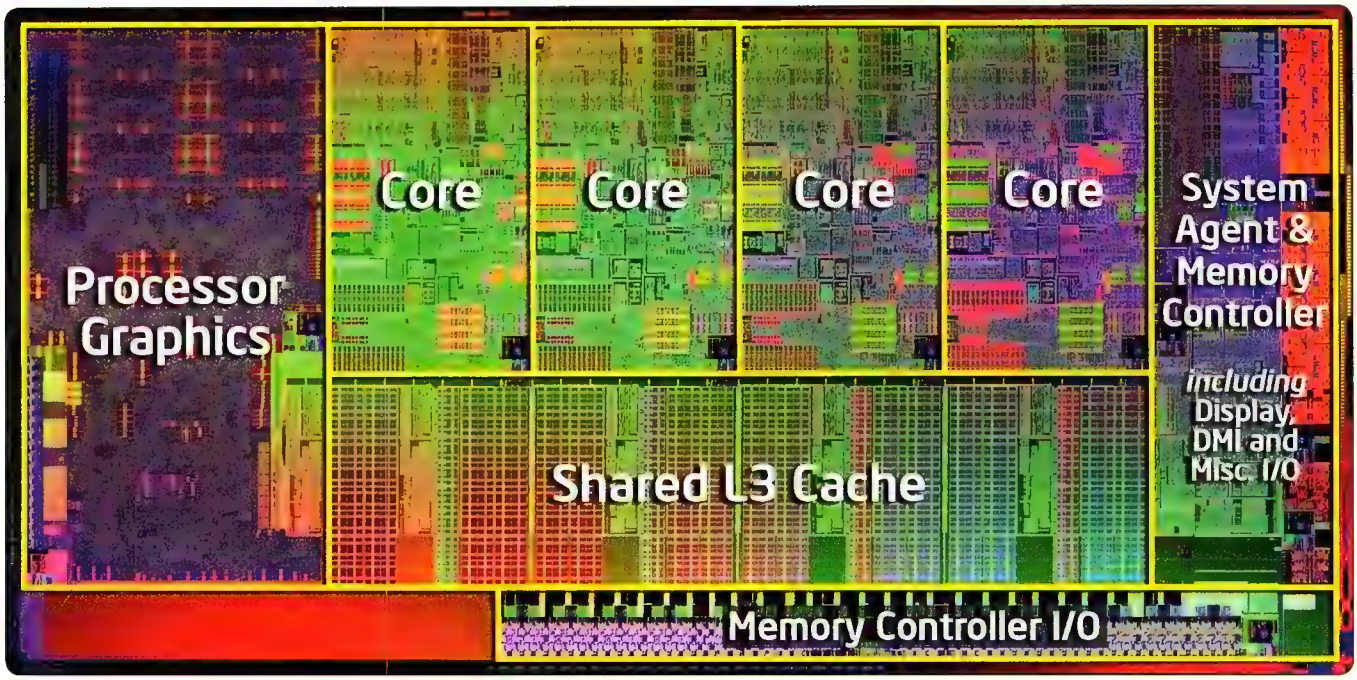
It seems that we've been hearing about Intel's next-gen CPU architecture, codenamed Sandy Bridge, for the past year, and previewing motherboards and revelling in the leaks for at least four months. In fact, it reached the point where we'd said 'Sandy Bridge' so often in the office that it started sounded stupid – Intel's coming in to show us its Sandy Bridge? Wouldn't a medical professional be more appropriate, we'd joke. That all ended soon after we received our first CPU samples and started our own testing – you got a taste of that last issue, but because of print timings we only had a few days to mess around. But now we've had more than a month with the new architecture. Our conclusions?

The Sandy Bridge CPU range is incredible, and it has the potential to change the entire PC industry.

Intel hasn't helped at all to convey the significance of its new line-up – the range is still branded Core i3, i5 and i7, making it hard to know whether it's new at all. The Internet has also been awash with rumours that Sandy Bridge won't overclock at all, or that it's so easy to do so and the CPUs are so fast that Sandy Bridge will make the LGA1366 Core i7 range redundant – not bad for a mid-range, mid-priced CPU. There's a lot to explain when it comes to the new Sandy Bridge range, so we've set aside five pages to cover every aspect of it, and we'll endeavour to blow away the myths and deliver the facts as clearly and concisely as possible.

What's new?

So to recap, Intel has beaten AMD to be the first CPU company to integrate a GPU into the silicon die of an x86 processor – it managed to integrate a GPU into the processor packaging



The lineup in detail

Frequency i5-2400: 3.1GHz, i5-2500K: 3.3GHz, i7-2600K: 3.4GHz

Core Sandy Bridge

Manufacturing process 32nm

GPU i5-2400: Intel HD Graphics 2000, i5-2500K and i7-2600K: Intel HD Graphics 3000

Number of cores i5-2400 and i5-2600K: 4 x physical, i7-2600K: 4 x physical and 4 x logical

Cache L1: 32KB + 32KB (each core), L2: 256KB (each core), L3: i5-2400 and i5-2500K 6MB (shared), i7-2600K 8MB (shared)

Memory controller Dual-channel DDR3, up to 1,333MHz

Packaging LGA1155

Thermal Design Power (TDP) 95W

Features SSE, SSE2, SSE3, SSSE3, SSE4, SSE4.2, EM64T, EIST, Execute Disable Bit, VT, AES-NI, Turbo Boost 2, AVX, Quick Sync Video

for its Clarksfield-based Core i3 and Core i5 CPUs. We've just started seeing AMD's Fusion combined CPU-GPU chips in netbooks (and they're damn sweet!), with desktop parts available in mid-2011. The Intel GPU in question is a significant update from previous Intel HD graphics, with enhanced gaming, video playback and GPGPU capabilities. It's available in two flavours – the Intel HD 2000 and the Intel HD 3000, which we discuss in Processor graphics (page 40).

The interesting aspect regarding the graphics unit is that it shares the 'last-level' cache of the entire die with the CPU execution cores. Intel's Shared Cache technology has worked incredibly well for it over the years; there's a big pool of Level 2 or 3 cache, and any CPU can reserve any amount it requires, therefore making that cache work as efficiently as possible. Allowing the GPU to tap into this shared resource is a logical step, but it required a radical rethink of how processing units access and address it.

In the end, Intel has implemented a ring bus, and not even an Intel Ring Bus Technology, which is an odd move for a company that loves to brand anything and everything that it creates. A ring bus controller polls each unit in a looping sequence, accepting or offloading data as it progresses – if the GPU requires data from the main memory (via the processor cache), it will have to wait until the CPU cores have been served first, before sending that request to the System Agent unit, which can pass it onto the integrated memory controller.

The inclusion of a GPU that's so tightly tied into the rest of the CPU, and the ring bus controller that allows this, may lead to advantages as far as GPU performance and efficiency is concerned, but it has led to one very controversial consequence: all the buses of an LGA1155 motherboard are controlled via one clock generator. This may not sound significant, but it means that overclocking via the Base Clock is extremely limited, if not impossible, as even sensitive buses such as SATA are linked to the ring bus clock. In our testing, we found that increasing the Base Clock beyond 105MHz (from the default 100MHz) resulted in lock-ups and crashes no matter which other BIOS options we tried. Overclocking is possible with Sandy Bridge CPUs, however – see Overclocking Sandy Bridge (page 38) to find out how to do this.

While manual overclocking should give you the most speed from a Sandy Bridge CPU, Intel has also updated its Turbo Boost technology to Intel Turbo Boost Technology 2.0. We've previously referred to the Turbo Boost of Lynnfield and Clarksfield as Turbo Boost (rev 2), as it was so much more effective than the Turbo Boost abilities of the LGA1336 CPUs, but we'll now refer to the Turbo Boost of Sandy Bridge CPUs as Turbo Boost 2. The reason for the updated name is the significantly updated technology.

Turbo Boost works by calculating how much heat a CPU is outputting from the amount of work it's doing and the power that it's consuming. Using these measurements, Turbo Boost allows some CPU cores to overclock themselves – if not all the cores are in use, they can run faster without causing the CPU as a whole to exceed its TDP or power draw limits. However, Turbo Boost 2 can push a CPU beyond the boundaries of its rated TDP and power draw by taking advantage of the 'thermal latency' of the cooler. Coolers don't heat up to maximum load immediately, and good coolers never do this, so a CPU can safely exceed its rated TDP for ages (or forever) before its operating temperature becomes potentially damaging. You can see the maximum Turbo Boost 2 frequency of Sandy Bridge CPUs in the LGA1155 processor line-up boxout.

The last upgrades to the CPU are the AVX extensions, which are analogous to SEE instructions but for video – it's a set of hardcoded logic in the CPU that can execute common but lengthy video-specific code very quickly. This, plus other architectural upgrades such as the ability of Sandy Bridge CPUs to execute two load/store commands

Spotting Sandy Bridge

Intel hasn't made it easy to identify its new range of CPUs, as they're still branded Core i3, Core i5 and Core i7. Even the new socket doesn't sound particularly new – if anything, LGA1155 sounds less advanced than LGA1156. There are some clues to help you identify the new processors, though, starting with a new logo. The Core i3, Core i5 and Core i7 ranges of Sandy Bridge CPU have different abilities and features.

Core i5-875K

Core i5-2500K

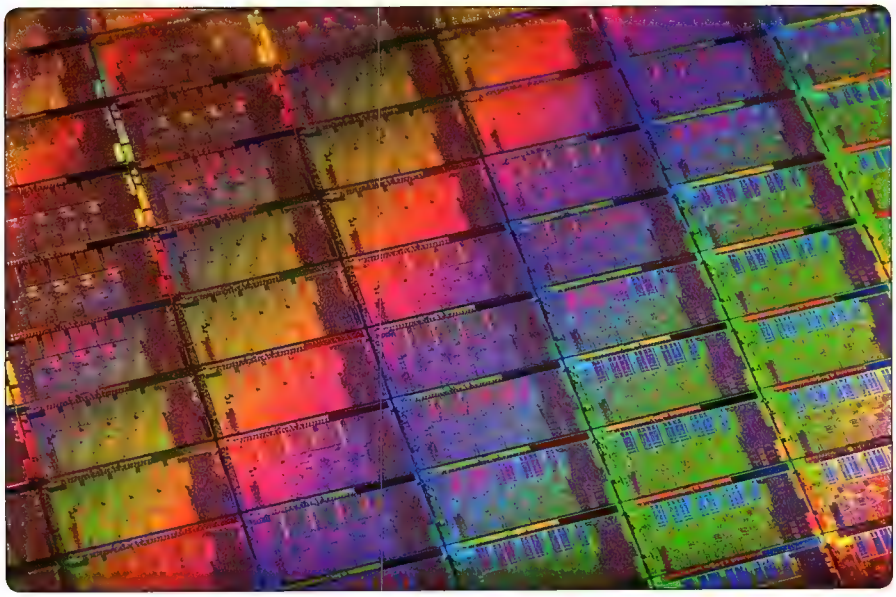
This is the new logo for the Sandy Bridge range – it shows the brand cracking apart to reveal the underlying technology, rather than peeling off as before.

As Intel is erroneously calling all its Sandy Bridge CPUs its second generation of Core CPUs, every model name starts with the number '2'.

You can also recognise a Sandy Bridge CPU by the four numerals in its model number rather than three.

Any CPU with a 'K' at the end of its model number has a fully unlocked CPU multiplier.

Intel is calling Sandy Bridge its second-generation Core architecture, which is completely wrong. The first Core-branded CPU was a laptop-only CPU based on the Yonah architecture of early 2006, followed by Conroe and its mobile equivalent Merom, which was sold under the Core 2 brand. Ignoring the Conroe update that was Allendale, manufacturing process shrinks of Wolfdale and Penryn, and the Core 2 Quad CPU designs, Intel should have realised that Nehalem counts as a new architecture. We therefore reckon that Sandy Bridge is Intel's fourth genuinely new Core architecture, not its second; and on a side note, it's scandalous that Intel should throw away the excellent pedigree of the Core brand by not recognising this.



simultaneously, leads Intel to claim that the Sandy Bridge architecture is 10 to fifteen per cent faster than any previous architecture clock for clock. Considering that the range also sports much higher frequencies, and Turbo Boost 2 boosts the frequencies more than Turbo Boost 1, the performance results are suitably impressive. The memory controller of a Sandy Bridge CPU is a dual-channel DDR3 unit, capable of speeds of up to 1,600MHz. As with previous LGA1156 CPUs, you need memory rated at 1.65V – meaning if you currently have an LGA1156 system, you can carry the memory across to your new LGA1155 rig.

Performance

As we managed to get our hands on three CPUs to test, we'll break up this section by CPU model. We should also remind you that only P67 motherboards allow CPU overclocking at the moment, so we used the Asus P8P67 for our testing. We'll start with the Core i5-2500K, as this is sure to be the most popular CPU for Atomicans, before moving onto the Hyper-Threaded Core i7-2600K, and the multiplier-locked and cheaper Core i5-2400. We've also expanded our testing somewhat to give a more comprehensive overview of the new range's performance.

The Core i5-2500K amazed us with its stock-speed performance – it even beat the epic Intel Core i7-980X Extreme Edition in the image editing and multi-threaded video encoding tests. Only the higher multi-tasking score of the i7-980X prevented the i5-2500K from being faster overall than the mighty 6-core super-CPU in everyday applications. It was only when we switched to the heavily multi-threaded Cinebench R11.5 that the i7-980X really shone, with a huge stock-speed score of 8.95 compared to the modest 5.47 of the i5-2500K. AMD's new 6-core Phenom II X6 1100T Black Edition managed a higher score at stock speeds, thanks to its extra pair of cores, but we should remember that the i5-2500K is cheaper than both these 6-core leviathans (massively so in the case of the i7-980X).

The i7-980X held its own against the new mid-range CPU in our gaming tests, managing to crank out an extra 1fps from Crysis when both CPUs were at stock speed. However, the much cheaper i5-2500K ran X3: Terran Conflict 8-11fps faster than the i7-980X, which was previously the fastest CPU for this game before the new range was launched. You'll notice that we haven't bothered to compare the i5-2500K with anything but the fastest CPUs that Intel and AMD have previously released – it walks all over everything else, as you can see from the graphs on page 41.

Even in the power consumption stakes, the i5-2500K is excellent, with the PC drawing only 76W from the wall when idle and 148W under load. Those figures compare favourably to cheap, low-end hardware; naturally, the X6 1100T and i7-980X draw more power from the wall by an exponential amount. The power to performance efficiency of the i5-2500K is staggering.

Then there's overclocking, and this is similarly impressive. The boost from a nominal 3.3GHz to 4.9GHz resulted in phenomenal performance: the overall Media Benchmark score jumped from 1,889 to 2,687, making the Sandy Bridge system slightly faster than an X58-based PC with a 4.4GHz i7-980X at its heart. We saw incredible performance gains in every application, with the i7-980X only making

...we haven't bothered to compare the i5-2500K with anything but the fastest CPUs that Intel and AMD have previously released...

How to overclock an LGA1155 CPU

The Internet has been alight with rumours that the new LGA1155 CPUs aren't overclockable, that the CPUs are locked and that this is the end of PC enthusiasm as we know it. That isn't quite accurate, however, as different Sandy Bridge CPUs have different overclocking capabilities. What is true is that overclocking via the Base Clock is severely limited, due to the constraint of having every bus derive its speed from a single clockgen. We saw a Base Clock overclock of 5MHz from the standard 100MHz produce crashes and lock-ups; and even Intel says that it's highly unlikely that you'll see the Base Clock of an Intel 6-series motherboard overclock by more than 10 per cent.

Overclocking is still possible via the CPU multiplier, but only if you buy a K-series CPU. If you have a sufficiently powerful cooler, you can set non-K processors to Turbo Boost harder than usual, but if you're interested in getting the most performance for your money, a Core i5-2500K is by far the best CPU at the moment. We've compiled a step-by-step guide to overclocking the CPU from 3.3GHz to 4.5GHz, a safe everyday level, in an Asus P8P67 motherboard.

1. Enter the BIOS by pressing Delete as the PC starts.
2. Enter the Advanced menu by clicking the button in the top-right corner.
3. Set the CPU multiplier to 45x.
4. Enable Extreme Load-Line Calibration.
5. Set the CPU voltage to 1.35V.
6. Set the CPU PLL to 1.9V.
7. Set the VCCSA to 1.1V.
8. Set the VCCIO to 1.106V.
9. Hit F10 to save and restart.

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Xtreme Systems	04-5660389	xtremesystem.co.nz

HAMILTON

PB Technologies	07 839 6518	pbtechnz.co.nz

a case for itself in Cinebench where its six Hyper-Threaded cores overclocked to 4.4GHz managed an awesome score of 11.22.

After gawping at the performance of the quad-core, non-Hyper-Threaded i5-2500K for a while, we turned our attention to the Core i7-2600K. This 3.4GHz quad-core, eight-thread CPU dominated the performance charts in all but the most multi-threaded of applications. Only in Cinebench R11.5 and WPrime was any CPU faster at stock speeds, with the six Hyper-Threaded cores of the i7-980X claiming the top spot. However, this CPU costs three times as much as the relatively modestly priced i7-2600K.

With a stock-speed overall Media Benchmark score of 2,080, we couldn't wait to see how many benchmark records we could smash with an overclocked i7-2600K. Unfortunately, we couldn't quite get the same 4.9GHz overclock from the CPU as we could with the i5-2500K, but by using a CPU multiplier of 48x without touching the Base Clock, we could wrench 4.8GHz from it. For this we used the same voltages and settings as we used with the i5-2500K. At 4.8GHz, the i7-2600K ripped through our Media Benchmarks, making us wince as it sailed past even a 4.4GHz i7-980X in our video encoding test (if only by 21 points). However, the extra frequency of the i5-2500K overclock gave it the lead in the image editing test, while the extra system bandwidth of its Base Clock-assisted overclock helped it to claim the top spot in the multi-tasking test. When both K-series CPUs were overclocked, only a few points separated them, although both were 100 points faster than the 4.4GHz i7-980X, which was considerably faster than the previous-generation quad-cores and AMD's latest 6-core CPU.

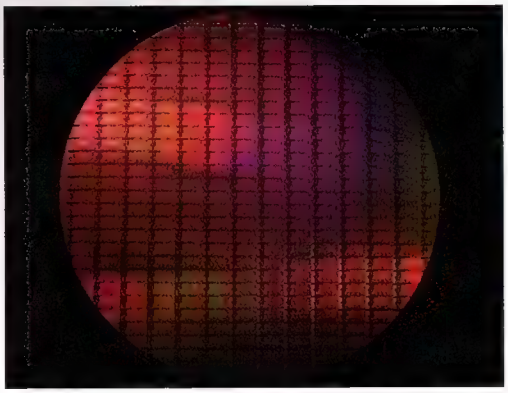
The extra frequency of the i5-2500K overclock helped it to be the fastest K-series CPU in Crysis with a minimum of 37fps rather than 42fps; but the i7-980X saved face by claiming the fastest minimum of 43fps. The i7-2600K managed to wrestle its way to top place in X3, where its minimum of 79fps was 9fps faster than the 4.9GHz i5-2500K and 15fps faster than the i7-980X. We were again blown away by how little power the i7-2600K consumed, even when overclocked and overvolted – we saw a power draw of 234W while overclocking while the 4.4GHz i7-980X system drew 368W.

After a sit down and stiff drink to recover from the incredible performance of the two K-series CPUs, we grew curious as to how a supposedly locked non-K-series CPU would perform and headed back to the test rig. The Core i5-2400 is a nominally 3.1GHz CPU that can boost up to 3.4GHz if only one core is in use – this rarely occurs, as Windows shuffles even single-threaded applications from one core to another to keep a multi-core CPU responsive. However, the way that the i5-2400 spent most of its time at 3.2GHz or 3.3GHz led to a solid overall score of 1,850 in our Media Benchmarks. This is faster than a stock-speed Core i7-950 by roughly 100 points, and faster than AMD's X6 1100T BE by more than 400 points.

Gaming performance wasn't quite as stellar as with the other Sandy Bridge CPUs, though, with Crysis dipping to a minimum of 29fps – of the CPUs we tested for this review, only the X6 1100T BE was slower. The i5-2400 was resurgent in X3, however, where it outperformed the i7-980X. As expected, the power draw of our test system with the i5-2400 installed was remarkably low, with only 75W sucked from the wall when idle and 142W when it was under full load.

However, the aspect that interested us most was how we could overclock this locked CPU. Non-K-series Sandy Bridge CPUs can be forced to Turbo Boost to a far greater degree, so we headed into the BIOS and tried to set a 47x CPU multiplier. This turned out to be way too optimistic, though, as the BIOS would only let us set a CPU multiplier of 38x at the most. We then overclocked the Base Clock to its maximum of 105MHz, set the Load Line Calibration to Extreme, sent 1.1V through the

Intel Processor Graphics



It's an insult to GPUs to call Intel's graphics chips fully-fledged GPUs - they've been notorious for their lack of features and horsepower for years. We suspect that it isn't this historical deficiency that led Intel to forbid the term 'integrated graphics', but the 'Processor Graphics' terminology is still handy - we'll shorten it to PG. The Intel HD Graphics 2000 has six execution units while the HD Graphics 3000 unit of K-series CPUs has 12 execution units. You have to use a H67 motherboard to activate the PG of a Sandy Bridge CPU.

Both PGs are only compatible with DirectX 10.1, an incremental step up from the DirectX 10 support of Clarkdale Core i3 and Core i5 CPUs. However, with a frequency of up to 1,350MHz (via a technology akin to Turbo Boost), the GP of a Core i5-2600K can run casual games fairly well. We could play Minecraft at 1,920 x 1,080 with the Fancy graphics setting, although we had to set the Render Distance to Short. Trackmania Nations Forever and Team Fortress 2 were playable at 1,920 x 1,080 with their maximum detail settings if we didn't use AA (Trackmania wouldn't allow this anyway).

Intel has also enhanced the media playback abilities of its new PG. Rather than putting media pre-processing, encoding and post-processing through the execution units, though, Intel has favoured the dedicated logic route to handle video playback. This is a more energy-efficient method, as ARM agrees with its recently launched Midgard GPU range (see Issue 89, p9). There's now H.264 and MPEG2 encoding abilities, plus colour-based post-processing advances and support for 3D via HDMI 1.4 output. In our test videos, we saw impressive results, with only our 58Mb/sec bit-rate 1080p clip proving slightly jittery. In our 33Mb/sec clip we didn't see any jitters, while in WHAT? other clips we saw a typical CPU use of zero, with only occasional spikes of 6 per cent use.

VCCSA and 1.10625V through the VCCIO. We didn't add any extra voltage to the CPU, either via the vcore or the PLL, and yet when we booted into Windows, the system ran Prime95 for hours.

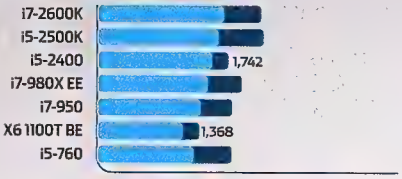
While a combination of a 38x CPU multiplier and 105MHz Base Clock should have given us a 3.99GHz CPU frequency, the i5-2400 would only hit this frequency if a single-threaded application was locked to a single core (we set one instance of the smallfft test to run on core 0, for example). For the rest of the time, the i5-2400 fluctuated between a frequency of 3.78GHz and 3.89GHz – we'll therefore say that we overclocked the i5-2400 to up to 3.99GHz. However odd this sounds, it's truly scary for AMD fans that the CPU would hit speeds of up to 3.99GHz with no extra CPU voltage – it would seem as though there's masses of frequency (and therefore performance) headroom in the Sandy Bridge architecture.

When overclocked, the i5-2400 didn't show the same performance increases that we saw from the K-series CPUs – this is hardly surprising given that it was only overclocked by up to 890MHz rather than by the 1.6GHz we saw from the i5-2500K. We still saw fast scores from the CPU, with Cinebench R11.5 returning 6.05 – faster than a stock-speed X6 1100T BE – and Crysis running with a minimum of 32fps. The overall Media Benchmark score rose from 1,850 to 2,152, which is hardly a bad result from overclocking a supposedly locked CPU.

Results

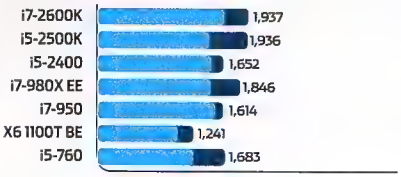
APPLICATIONS

GIMP IMAGE EDITING

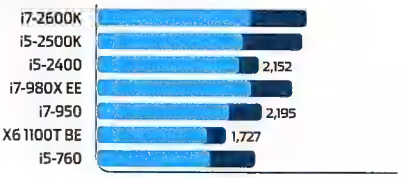


HANDBRAKE H.264 VIDEO ENCODING

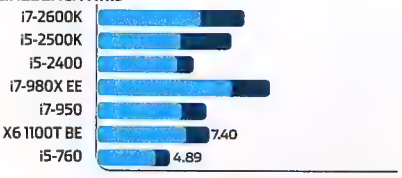
MULTI-TASKING



OVERALL

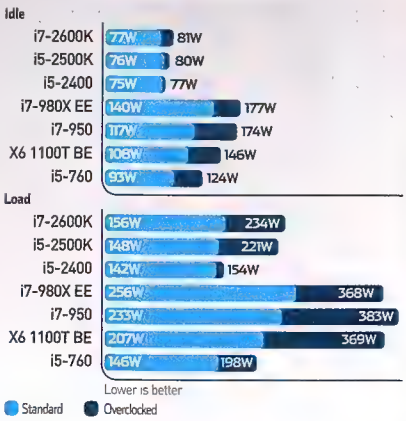


CINEBENCH R11.5



WPRIME 32M

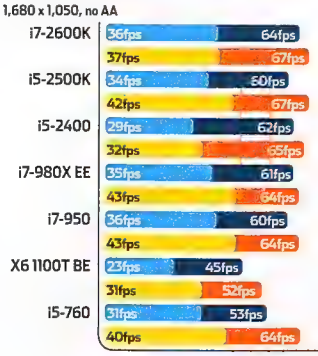
TOTAL SYSTEM POWER CONSUMPTION



3D

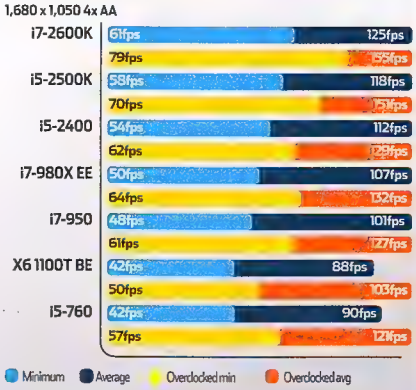
CRYSIS (DX10, 64-BIT)

1,680 x 1,050, no AA



X3: TERRAN CONFLICT

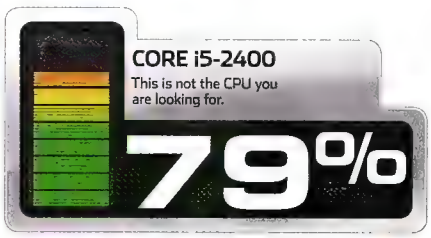
1,680 x 1,050 4x AA

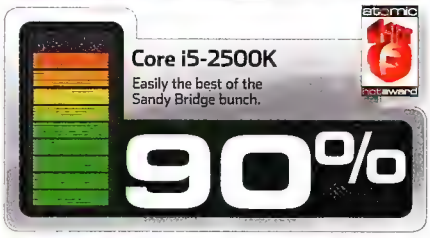


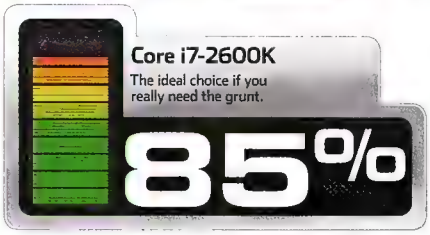
Test kit: Asus P8P67, Gigabyte GA-P55M-UD2, Asus Crosshair IV Formula and Asus P6TD motherboards, 4GB or 6GB Corsair 1,600MHz DDR3 memory, 2TB Western Digital Caviar Black hard disk, ATI Radeon HD 5870 graphics card, OCZ Silencer 750W PSU, Windows 7 64-bit, Catalyst 10.11 WHQL (chipset and graphics)

Conclusion

This is probably the easiest conclusion we'll write this year. The new range of Intel CPUs makes almost every other processor redundant and pointless. Only if you use heavily multi-threaded, professional-level applications should you look any further than the fastest LGA1155 CPU you can afford, and if you plan to overclock that LGA1155 CPU, you should ignore everything but a K-series model. If you use your PC for a lot of casual media creation and encoding then the i7-2600K is excellent, but everyone else should buy the i5-2500K. Pair either CPU with the $150 Asus P8P67 and you'll have an incredibly fast, quiet and cool-running PC for little cost.







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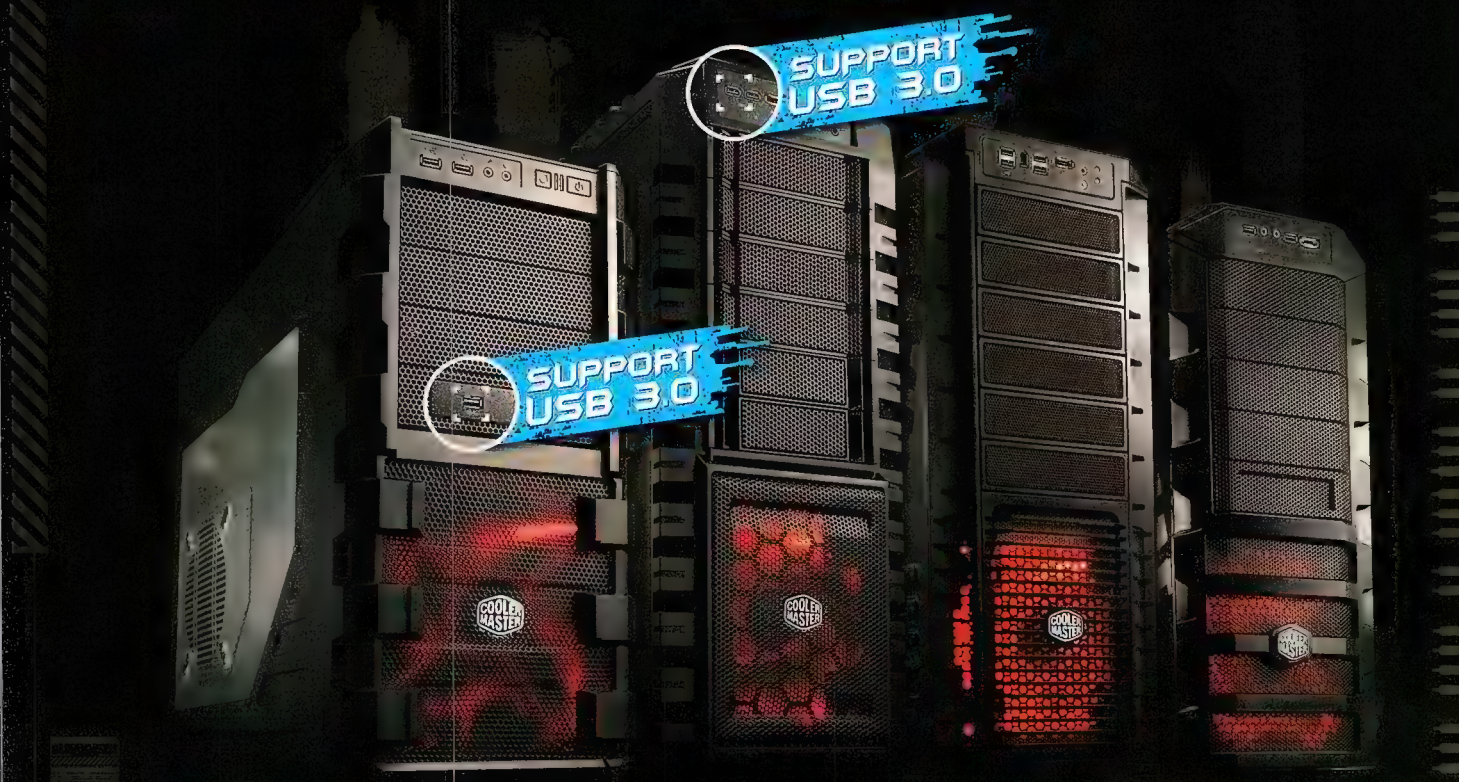

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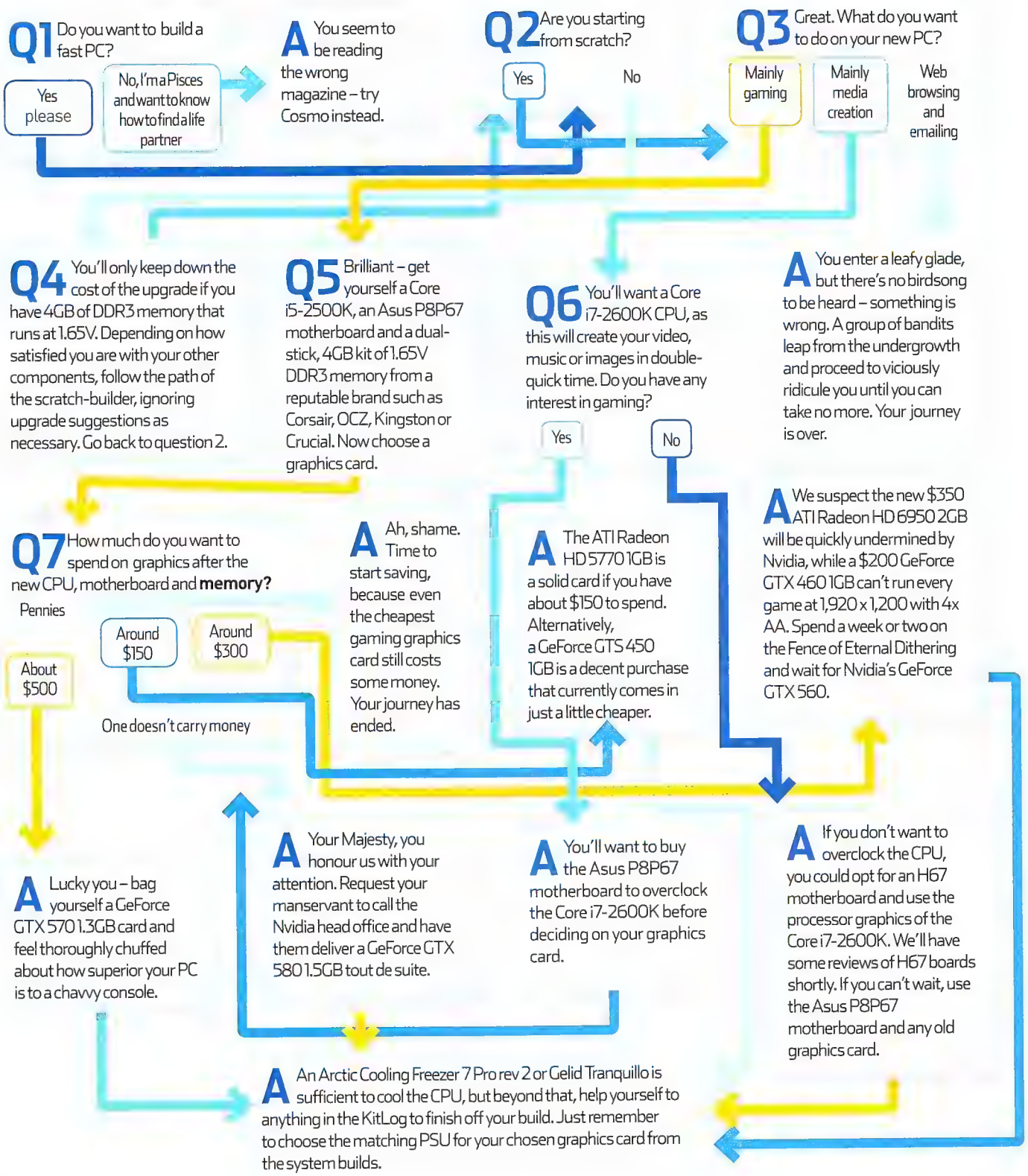
	YNOT Computer Systems	08 9330 7666	www.ycs.net.au
	Netplus Micro Computers	08 9242 7288	www.netplus.com.au

Plan Your Sandy Bridge Upgrade

Intel's new Core processor range is as brilliant as it is confusing – we help you to plan your next upgrade.



ASROCK FATAL1TY P67 Professiona

Sandy Bridge gets overclocked mouse ports and Fatal1ty's face in the BIOS.

Street Price $288 **Supplier** ASROCK
Website www.asrock.com

Specifications Socket 1155; Intel P67 chipset; ATX Form Factor; 3 x PCI-e x16 (2 x x8, 1 x x4 electrically); 2 x PCI-e x1; 2 x PCI; 6 x SATA 6Gb/s; 4 x SATA 3Gbps, DDR3 2133

It seems that a large chunk of the component industry doesn't get the difference between gamers and overclockers. It also breeds an environment where somebody serious thinks that people want to spend their time in the BIOS staring at Johnathan 'Fatal1ty' Wendell's brooding face.

The Fatal1ty brand is one of the most enduring in the PC industry. One of the standout features of the Computex trade show midway through last decade was that you would invariably turn a corner to find Fatal1ty sitting outside a shopping centre pwning noobs for whatever company was using him as a brand that year (He's actually a really nice guy, but we shouldn't let that get in the way of branding).

The latest brand to bear his trademark red and black colour scheme and 1337ified name is ASROCK, who has named their high end gaming P67 board after him. Fatl1ty has also had input into the design, apparently, which manifests itself in special 'overclocked' USB ports designed for maximum mousing potential. We're somewhat dubious of these claims, and haven't noticed any difference when gaming on the overclocked mouse ports.

Apart from this, the Fatal1ty is a decently featured P67 motherboard whose main claim to fame is being cheaper than competing options. It has four USB 3 ports on the back and a header to drive front panel USB 3 (it comes with two USB 3 ports that mount in a 3.5in drive bay for cases without USB 3 front ports). These use a controller chip from Etron, which at the time of writing had still not received certification from the USB Implementers Forums, which is worth considering if USB 3 is important to you. The I/O plane also includes eSATA, IEEE1394 and dual gigabit LAN with teaming support.

The board has the P67's obligatory four DIMM slots and there's enough room around the CPU socket to fit a monster-sized cooler and only obscure a single slot. PCI-Express connectivity is delivered through three x16 and a sole x1 slot – ASROCK is using an nf200 chip from NVIDIA to drive the extra PCI-E lanes. For those with legacy hardware there are also two PCI slots (although the design means that one of the PCI slots will inevitably be blocked by a graphics card). There are also a total of ten SATA ports on the edge of the board – six of these support SATA 6Gbps while the other four are the standard P67 SATA 3Gbps ones.

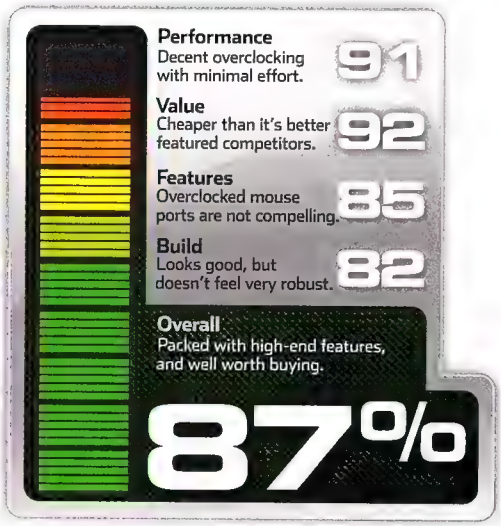
This all combines to make this a very feature-rich offering at a reasonable price. ASROCK has added a swathe of overclocking options to the board as well, and while it isn't in the same class as the Gigabyte and ASUS boards reviewed in the issue, we were happily able to set it to the maximum 'auto' setting of 4.8GHz on the Core i7 2600K CPU and it was stable and ran our benchmarks without issue.

For a motherboard targeted at gamers this is pretty impressive. It not only offers stable performance but great overclocks are but a few clicks away in the UEFI-enabled BIOS. In our testing the results were pretty much as we'd expect, slightly behind those delivered by the 5GHz overclocks on the GIGABYTE and ASUS boards. Where the board did manage to shine was in the Cinebench testing, where the results were simply outstanding.

For a board targeted at gamers though, bleeding edge overclocking is less of a focus than the board running stably in games. For it to do so with things cranked up to max is a great thing indeed. While Gigabyte and ASUS may have a much deeper overclocking focus, ASROCK's Fatal1ty is a pretty good all rounder – we just worry that the selling points are pure marketing novelty and not something that gamers will actually care about. **JG**

ASROCK FATAL1TY P67 Professional

2600K	100x48; DDR3-1866 9-9-9-24	100x35; DDR3-2133 9-9-9-24
PiFast	15.55s	19.61s
wPrime 32M - single thread	29.143s	37.112s
wPrime 32M - multi-thread	7.74s	7.74s
CineBench R10 64bit - single thread	8006	6089
CineBench R10 64bit - multi-thread	31429 (3.93x efficiency)	22995 (3.78x efficiency)

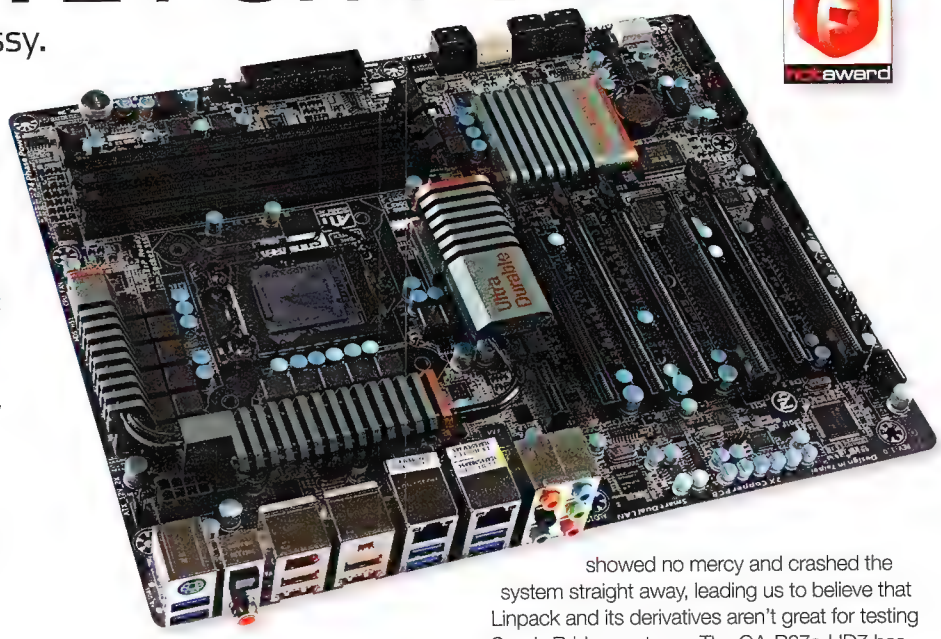


GIGABYTE P67A-UD7

Top-of-the-class meets classy.

Street Price $365 **Supplier** Gigabyte
Website www.gigabyte.com.au

Specifications Socket 1155; Intel P67 Express chipset; ATX form factor; 4 x PCI-e x16 (2 x 16x, 2 x 8x electrically); 1 x PCI-e 1x; 2 x PCI; 4 x SATA2, 4 x SATA3, 2 x 6Gb/s eSATA; DDR3-2133



To sum this motherboard up in one word, that word would be 'wow'.

Now, we like to think we're not shallow folks here in the labs, but who could look past the gentle curves of the heatsinks, linked by perfectly extruded heat-pipes to adjacent graphite and gold blocks of glorious aluminium? Below, the PCB, in matte black and housing the similarly hued expansion slots (so long, blue!)

No high profile cooling tower interrupts your play, and no active cooling drives you insane – this technical masterpiece is truly elegant.

Component layout has been well thought out, with both Marvell 88SE9128 and Intel ports running along the edge of the board. The UD7 provides four 6Gb/s and four 3Gb/s SATA ports, in addition to two 6Gb/s eSATA ports on the I/O panel. Oh, and it supports booting from 3TB+ drives right out of the box!

Four DIMM sockets lie beside the LGA1155 socket at a distance suitable for running both sizable CPU heatsinks and tall memory modules at once, and even the massive Noctua NH-D14 leaves two slots free for easy access.

A small niggle we do have with the layout is that the PCI-e 1x slot is isolated by the NF200 heatsink. That lengthy PCI-e audio/TV card is going to have to move into a beefier 16x home.

Intel's P67 express chipset brings with it 16 lanes (16Gb/s) of PCI-e bandwidth, which splits into two 8x slots in dual-card configurations. GIGABYTE has taken this one step further and implemented the Nvidia NF200 chipset to allow 16x/16x in 2-way SLI, and 16x/16x/8x via 3-way SLI. Crossfire functions similarly.

Ultra Durable 3 adds two layers of two ounce (57g) copper to the PCB. This helps to dissipate heat, for the best chance of hitting that target overclock. The Dual-BIOS system is also handy for restoring a stable BIOS after issues such as BIOS corruption, and VRD 12 compliance.

Sandy Bridge marks the first PC platform to get the EFI bandwagon rolling. Unlike ASUS' Maximus Extreme IV, GIGABYTE has stuck with its traditional Award BIOS. These are 32Mbit flash BIOSes, though, so there's a chance that GIGABYTE is cooking up an EFI upgrade.

Six USB 3.0 ports are included on the I/O panel, with the option to connect four more via on-board headers. Dual Gigabit LAN ports come courtesy of two Realtek RTL8111E controllers.

Overclocking performance is spectacular – at least, once you update the BIOS. Originally we found ourselves stuck at 4.9GHz on our engineering sample 2600K using the F4 BIOS (albeit, at a nice 1.3v). The jump to beta BIOS F7e yielded a well received improvement.

We reached a whopping 5.2GHz 20 minutes, Linpack stable at 1.464v (Level 1 LLC) after vDroop from the BIOS setting of 1.51v. Prime95 showed no mercy and crashed the system straight away, leading us to believe that Linpack and its derivatives aren't great for testing Sandy Bridge systems. The GA-P67a-UD7 has three levels of LLC, 'Standard', 'Level 1' and 'Level 2'. We found that standard did nothing to prevent vDroop, while 'Level 1' provided a small improvement, and Level 2 overshot the mark dreadfully, at one stage taking 1.45v to 1.5v according to CPU-z v1.56.2.

We finally settled at 5GHz (Prime95 and Linpack stable) as our benchmark clock rate, running at a fairly comfortable 1.42v under load. Surprisingly, the on-board heatsinks were only warm to the touch.

A debug LED is located near the front panel connectors, while nearby power and CMOS reset buttons facilitate overclocking sessions without resorting to shorting pins.

All of that considered, the $365 cost is hardly surprising. It's well into X58 territory, but if you want the best shot at cracking some records, the price difference soon becomes moot. VC

GIGABYTE P67A-UD7

2600K	100x50; DDR3-2133 9-9-9-24	100x50; DDR3-1866 9-9-9-24	100x35; DDR3-2133 9-9-9-24
PiFast	14.77s	14.85s	21s
wPrime 32M - single thread	28.001s	28.003s	40.232s
wPrime 32M - multi-thread	7.08s	7.066s	7.349s
CineBench R10 64bit - single thread	8319	8321	5827
CineBench R10 64bit - multi-thread	30131 (3.62x efficiency)	29021 (3.49x)	23357 (4.01x)
Everest Read	23291MB/s	21402MB/s	20099MB/s
Everest Write	36465MB/s	33747MB/s	27315MB/s
Everest Latency	24.8ns	28ns	29.9ns

Performance Overclocks brilliantly, mediocre POST speed. 95

Value Pricey for P67, many enthusiast features. 85

Features Highly tweakable, handy on-board aids. 90

Build Beautiful and cool; silly PCI-e 1x position. 90

Overall A highly commendable board; definitely one for the tinkerers.

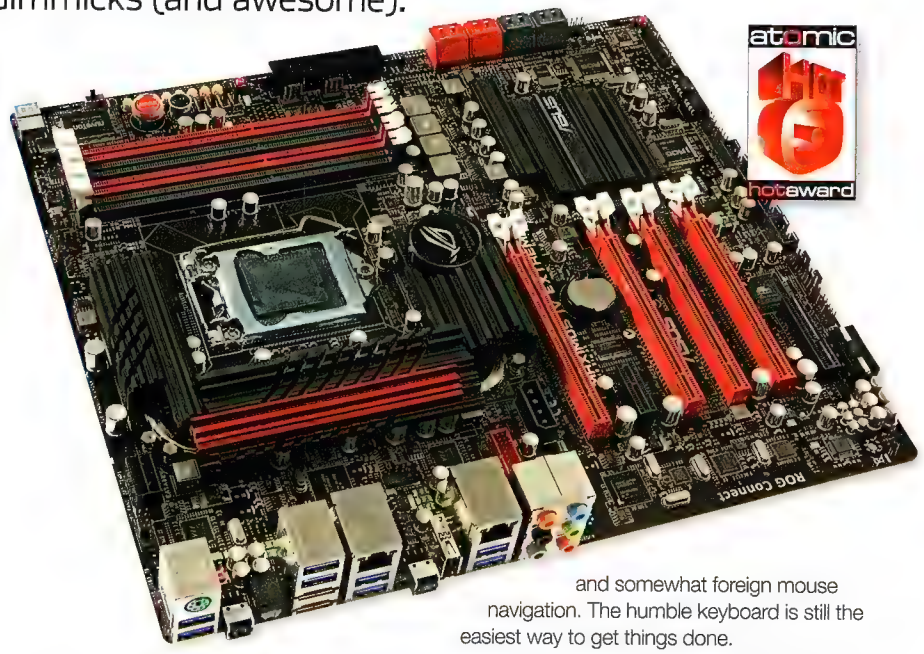
90%

ASUS Maximus IV Extreme

Direct from the Republic of Gimmicks (and awesome).

Street Price $475 **Supplier** ASUS
Website www.asus.com.au

Specifications Socket 1155; Intel P67 express chipset; E-ATX form factor; 4 x PCI-e x16 (3 x 16x, 1 x 8x electrically); 1 x PCI-e 1x; 1 x PCI-e 4x; 4 x SATA2, 4 x SATA3, 2 x 3Gb/s eSATA; DDR3-2200 (OC)



Oh, quiet you! We admit it. We're fans of ASUS – the company does an awesome job producing reliable motherboards for the enthusiast crowd.

There are many features to cover with this beast, including the ability to overclock and monitor the PC via your iPhone/iPad via ROG iDirect, or through a notebook using ROG Direct. But perhaps the most important feature is the ability to print your BIOS settings to a thumbdrive. Oh yes, it's now easier to share your e-peen, thanks to a special inclusion by the name of EFI.

EFI, or Extensible Firmware Interface, has finally caught on as a replacement to the legacy BIOS (Basic Input Output/System). EFI offers faster bootup, and in this case, a graphical setup interface. It also brings with it features such as the aforementioned print support, snappier navigation and 3TB+ boot support.

The Maximus IV Extreme has much the same layout as its predecessor. The voltage read points, power/restart buttons and the debug LCD all reside near the DIMM slots, along with a few intriguing additions such as 'LN2 Mode' and PCI-e lane switches. LN2 Mode helps combat the infamous 'cold bug' when dropping temperatures below 20 degrees Celsius. The PCI-e lane switches let the user turn PCI-e lanes off/on to troubleshoot malfunctioning cards, saving the need for physical labour.

The P67 Express chipset offers two 6Gb/s SATA connections for all your SSD needs, and four 3Gb/s legacy ports. An additional Marvell 9182 controller adds a couple of extra 6Gb/s ports. Two NEC USB 3.0 controllers power eight ports on the I/O panel, alongside a single Intel-driven USB 2.0 port. Another two USB 3.0 and nine USB 2.0 headers reside on-board.

Realtek powers the audio side of things with its ALC889 codec; the two Gigabit LAN ports are powered via Intel. Bluetooth is made available via the provided add-on card (when not being used for iDirect).

PCI-e bandwidth, as with all P67 boards, is restricted to 16x, which is split between PCI-e sockets. To keep enthusiasts happy, an NF200 chip is available to effectively double the available bandwidth to 32x. Officially, this board is Triple SLI/CrossfireX capable at 16x/16x/8x and 8x/8x for dual cards. ASUS has deliberately avoided the use of the NF200 controller until absolutely necessary, so dual cards are not in 16x/16x as you'd expect. This is to avoid latency introduced by the NF200 controller, after all, 2 x 8x has little performance impact on dual card systems.

After a moment admiring ASUS's lavish red EFI interface, we started playing around, soon becoming accustomed to the tabbed layout and somewhat foreign mouse navigation. The humble keyboard is still the easiest way to get things done.

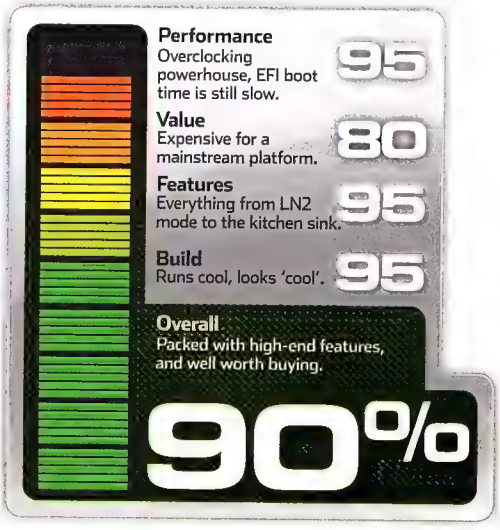
Overclocking was fairly straightforward. There are four levels of LLC (Load Line Calibration), 25 per cent, 50 per cent, 75 per cent and 100 per cent. Running the CPU at 5GHz (50x multi), we found that 75 per cent with a voltage of 1.475v gave us 1.48v under load, while 100 per cent with 1.45v raised the voltage under load to an excessive 1.505v.

Like with the P67a-UD7, the originally installed firmware limited us to a maximum stable clock of 4.9GHz. Again, CPU PLL overvoltage is critical to overcoming the 5GHz barrier, which is only available on later revisions.

With so many features targeting gamers, tinkerers, and overclockers, it's hard to pin point just who this motherboard is aimed at. With a street price of $475, you will need deep pockets – but you get what you pay for. VC

ASUS Maximus IV Extreme

2600K	100x50; DDR3-2133 9-9-9-24	100x50; DDR3-1866 9-9-9-24	100x35; DDR3-2133 9-9-9-24
PiFast	14.85s	14.88s	21.04s
wPrime 32M - single thread	27.923s	27.941s	39.765s
wPrime 32M - multi-thread	7.193s	7.193s	10.125s
CineBench R10 64bit - single thread	8410	8432	5915
CineBench R10 64bit - multi-thread	30414 (3.62x efficiency)	29653 (3.52x)	21125 (3.57x)
Everest Read	24348MB/s	24217MB/s	20686MB/s
Everest Write	36629MB/s	36666MB/s	27517MB/s
Everest Latency	23.9ns	23.9ns	29.1ns



Noctua NH-D14 CPU Cooler

It's oh so quiet. And cool too.

Street Price $108 Supplier Noctua
Website www.noctua.at/

Specifications Twin-radiator; twelve heatpipes; aluminium fins with copper base and heatpipes; 120mm/140mm fans, each 1300RPM <20dB; 160x140x158; 775/1155/1156/1366/AM2/AM2+/AM3

Noctua is well known in enthusiast circles for its high performance coolers, with low noise levels, and trademark cream and maroon fans. What we have here is its most ambitious product yet, the twin-radiator dual-fan monstrosity that is the NH-D14. To get a feeling for how large this oversized block of aluminium is, it eclipses two memory slots on both the GA-P67A-UD7 and Maximus Extreme IV with no fan attached. Fortunately, you can mount the fan on either side (whichever is least obtrusive).

Two sets of six heatpipes transfer heat from the copper base to the pair of radiators, made up of layered aluminium fins. The provided fans push and pull air through; one to the side, and one directly between the two radiators, each well secured with metal clips. The height of the fans can be adjusted thanks to the innovative clip design, which slots in neatly between the fins.

With almost a kilo of metal on your processor, you'd expect it to run cool. We grabbed our shiny new 2600K processor and put the D14 to the test. At 3.5GHz with Hyper-Threading disabled, the BIOS reported a temperature of 26c – nice and cool. Five minutes of Linpack later, we reached our maximum temperature of 52c, which is not too shabby!

Not allowing Noctua to run away with the crown too easily, we pushed the CPU to 5GHz and retested. The temperature within the BIOS was 37c, still very cool considering the 47 per cent overclock. Further stress testing revealed a maximum of 78c, a very respectable temperature.

To compare, the stock cooler for the 2600K reached 33c in the BIOS at 3.5GHz, and 48c at 5GHz. Under load, the 3.5GHz test shot up to 61c, and a gut wrenching 98c at 5GHz. It also sounded like a rampant hair dryer compared to the whisper quiet NH-D14.

With brackets to suit all modern Intel and AMD sockets, there should be no problem securing this impressive HSF to your platform of choice. And at a reasonable $108 street price, there's little reason not to go out and grab one – provided it fits in your case. VC

Overall
Bulky, yet quiet and effective.

90%

Team Xtreem Dark TXD38192M1600HC9DC-D

Not to be handled by unauthorised personnel.

Street Price $161 Supplier Team Group Inc.
Website http://www.teamgroup.com.tw

Specifications 2 x 4GB kit; PC3-12800 (1600MHz), 9-9-9-24; 1.65v; 240-pin DIMM; Non-ECCC unbuffered DDR3

Unauthorised personnel only? Well, that's what the yellow warning sticker securing the individually-wrapped memory modules states. Since Atomic is always authorised to do anything, we proceed to unwrap and install the unsuspecting chips into our test bench.

Team Group's self-proclaimed 'Overclocking memory modules' perform nicely, unleashes their overclocking headroom by attaining a maximum clock rate of 1750MHz at the default latencies.

After much fiddling, the lowest latencies at 1750MHz were a mildly disappointing 9-9-9-24-1T, the only difference being the command rate. This small change did produce a 2ns latency drop, in addition to a small improvement in read/write throughput. Alas, this made little difference to PiFast and wPrime results, the latter actually coming out approximately 0.2s slower.

Raising latencies to CL10 refused to lift the 1750MHz barrier. This left us desperately short of the 1866MHz required to run overclocked on our shiny new Sandy Bridge machine (you get 16x and then 18.6x as a memory multiplier, with an effectively fixed 100MHz base clock). So if you're looking at these sticks for P67 overclocking runs, you're likely to be stuck at stock. Naturally, expecting a 288MHz overclock is quite a demand, so this was not surprising.

Physically, these RAM modules are compact, with nothing across the top to prevent large heatsinks from being installed.

The Green PCB is an aethetic letdown – we can only guess that it's a cost-cutting measure.

Overall, the memory does perform quite well with a respectable 150MHz overclock, and at $161 for 8GB, it's not a bad buy either. VC

i7 920	DDR3-1670, 9-9-9-24-T1, 1.65v; 167 x 21 = 3.5GHz	DDR3-1750, 9-9-9-24-T1, 1.65v; 175 x 20 = 3.5GHz
PiFast	25.16s	25.04s
wPrime 32M - multi-thread (HT off)	10.887s	11.091s
Everest Read	17133 MB/s	18025 MB/s
Everest Write	14473 MB/s	15180 MB/s
Everest Latency	42.3 ns	40.5 ns

Overall
Good value meets solid performance.

75%

"This is simply one of the fastest PCI Express based SSD solutions we've tested to date and its price/performance ratio literally shatters anything we've seen thus far." – Hot Hardware

"It simply rocks. It's hands-down the fastest SSD we have used and its elegant simplicity in use and installation makes it all the more appealing for users of all levels." – Legit Reviews

"...the fastest single SSD product you can install in your system. It is almost inconceivable that it's also one of the easiest RAID products to install as well." – Tweaktown

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Patriot Viper II Sector 7 PV736G2000ELK

Even with a large heatsink, a Dodge would be cooler.

Street Price $275 Supplier Patriot Memory
Website www.patriotmem.com/
Specifications 3 x 6GB kit; PC3-16000 (2000MHz), 9-9-9-27; 1.65v; 240-pin DIMM; Non-ECCC unbuffered DDR3

In the wild, one can spot a male Patriot Viper DIMM by the distinct rectangular barbs running the length of its spine. It is believed these are used to cool the beast, whilst fending off predators such as CPU heatsinks that watch over it, waiting for a chance to fit.

ahem

Aiming to maintain a consistent clock rate of 3.5GHz during testing, we set upon prodding the glossy black and blue sticks. Their stock performance was respectable, with a result of 20244 MB/s/16601 MB/s in Everest read/write.

Going the low latency route, we achieved an impressive 6-8-6-18-T1 at 1660MHz. Unfortunately, this didn't translate in benchmarks – common with DDR3 memory. Both read and write speeds dropped considerably, the latency rose, and our synthetic benchmarks spat out uninspiring results.

Attempting to raise the clock rate instead, the PC refused to play nice above the rated 2000MHz, regardless of how loose the timings were set. In an attempt to squeeze as much performance as possible, the latency was dropped to 8-9-8-21-T1 which gave us our best result of 20574 MB/s/16600 MB/s read/write. PiFast and wPrime took to this well, with marginal yet measurable gains.

During all this, the temperatures of the sticks remained tepid, thanks to those distinct aluminium barbs.

These sticks do perform well, despite their limited overclocking headroom. At a cost of $275 for the trio, however, we're inclined to lean toward a cheaper set of Ripjaws. VC

i7 920	DDR3-2004, 9-9-9-27-T1, 1.65v; 167 x 21 = 3.5GHz	DDR3-2004, 8-9-8-21-1T, 1.65v; 167 x 20 = 3.5GHz	DDR3-1670, 6-8-6-18-1T, 1.65v; 167 x 20 = 3.5GHz
PiFast	25.16s	25.01	25.13
wPrime 32M - multi-thread (HT off)	10.887s	10.811s	11.541s
Everest Read	20244 MB/s	20574 MB/s	18769 MB/s
Everest Write	16601 MB/s	16600 MB/s	14459 MB/s
Everest Latency	43.2 ns	42.8 ns	44.8 ns

Overall
Performs well, but there are better cheaper options.

75%

Team Group Xtreem LV TXD38192M2000HC9DC-L

Keep out of reach of spelling Nazis.

Street Price $200 Supplier Team Group Inc.
Website www.teamgroup.com.tw
Specifications 2 x 4GB kit; PC3-16000 (2000MHz), 9-11-9-27; 1.65v; 240-pin DIMM; Non-ECCC unbuffered DDR3

'Low Voltage' is usually the last thing you'd hear from an Atomican, with systems clocked at insane speeds at equally crazy voltages. But when it comes to memory, low voltage is what you want – it allows processors with integrated memory controllers to run at lower voltages (e.g. QPI/vTT on Core i5/i7 processors). This means a cooler chip and the possibility to push your system that bit further.

i7 920	DDR3-2004, 9-11-9-27-T1, 1.65v; 167 x 21 = 3.5GHz
PiFast	25.05s
wPrime 32M - multi-thread (HT off)	11.295s
Everest Read	20066 MB/s
Everest Write	16589 MB/s
Everest Latency	37.4 ns

When it comes to this pair of 'LV' sticks, we're still dealing with the current 1.65v trend. 1.65v is touted as the recommended maximum voltage due to the sensitivity of the QPI link, where the infamous degradation problem occurs when the voltage (potential difference) between it and your memory exceeds 0.5v.

Regarding performance, Team Group's offering does exceptionally well, with read/write throughput of 20066 MB/s/16589 MB/s and a very respectable 37.4 ns latency at 3.5GHz on the accompanying i7 920 processor. Compare this with the kit above, and you can see why this is impressive.

But then the fun stops.

Pushing the memory above 2000MHz would fail to pass Linpack tests, with loosening latencies having no effect. At stock clock rate, we're unable to tweak latencies without encountering booting issues. It quickly became apparent that these sticks were not budging.

On a more positive note, the modules are encased in a slick black aluminium heatsink,

which works well to keep each unit cool under load.

When it comes down to it, this kit sits well at its $200 price point. 8GB of memory is plenty for modern day usage, although the 2000MHz rating probably isn't going to do Sandy Bridge owners a favour with a choice of 1866MHz or 2133MHz; the latter we know is not going to happen. VC

Overall
Powerful and well priced, but won't budge from stock.

80%

Razer BlackWidow Ultimate

We're not just loving this keyboard – we're drinking the kool aid!

Street Price $160 **Supplier** Razer
Website www.razerzone.com

Specifications Full-size keyboard; mechanical keys; 1000Hz polling time, 1ms response; 5x programmable keys; 10x software profiles; multimedia controls; braided cable; 1x audio out, 1x mic, 1x USB; 1.5kg.

Well, the tide, as they say, has turned. We're seriously thinking about taking our loved, key-worn and remarkably trustworthy Microsoft X6 keyboard and replacing it with a new, shiny, and oh so responsive Black Widow.

For anyone who knows anything about our love of the X6, which has only increased since our initial admittedly lukewarm review, that's probably enough of a review right there. But we wouldn't be doing our job (or filling this page) if we didn't go a wee bit further to illustrate the Black Widow's awesomeness.

Clickety-click

Hell – even the Black Widow's packaging is classy, with tabs and slots all over the place that mean you don't have to actually destroy the thing to get your keyboard. And when you do pull it clear of all that shiny plastic and cardboard... it's impressive without even being plugged in.

Like all mechanical keyboards, it's heavy – but it feels solid and ready to take a lot of punishment. There's an outer strip of high gloss plastic that we just know is going to piss us off eventually, but at least the keys themselves are a good matt black. The long, cloth-braided cable is also a pleasing addition – this board'll plug into your PC no matter where it is in your desk setup.

Further helping with connectivity, the Black Widow boasts pass-throughs for audio and a single USB device. You could plug your mouse in, but it makes for a handy point to access a USB stick or similar device when you need to. There are two adjustable feet under the board, and, impressively, these can be set to two heights.

In fact, about the only thing the board is missing physically is an extended wrist rest – we've rather gotten used to one and aren't so sure we want to give it up.

And then, of course, there's that keystroke action. Even before it's plugged in and in-game, just pressing the keys is an almost... well, sensual experience. Call us weird (we've heard it before), but it's just so good! The deep action, the incredible tactile and sonic feedback – it's all so satisfying.

But there's a learning curve involved with the Black Widow that's going to take a lot of time to get on top of.

The vast majority of us do most of our typing and gaming on a keyboard that uses a rubber in-lay – a non-mechanical solution. It's mushy and not all that tactile, and prone to wear, but it's what our fingers are used to. Switching from this kind of rubber dome setup to a mechanical keyboard is actually a much bigger feat than it might seem, and at first the Black Widow actually seems like it's pretty crappy to use. In our initial testing, both in gaming and day to day typing, it seems frustratingly clumsy and inaccurate.

But give it time.

Serious touch typists swear by a good mechanical keyboard, and after typing on one for a little while, you'll begin to see why. Once you get over the hump of the deeper travel and seemingly wider spacing between keys, the sense of feedback – and the BlackWidow delivers both an audible and tactile click – really helps typing accuracy. Gaming does take some more getting used to, and our timed runs through Call of Duty 4's Killhouse level were slow at first using the BlackWidow, not to mention full of disastrous mis-keys, like flashbanging ourselves in the face. After some practice, though, the keyboard becomes a real joy to use.

However, we suspect it's not really the shooter fans that'll get the most out of the BlackWidow – this board is really aimed at strategy and MMO players. Such games use much more of the keyboard, and with elegant on-the-fly macro creation, plus software-based macro setups and ten profiles to switch through, this is where the BlackWidow comes into its own. The kind of solid feedback you get with this board also helps – you really know when you've gotten off a Frostbolt!

Not that we know what that means, of course...

About the only issue, of course, is the price. Razer's put a whole lot of effort into the BlackWidow, so you're certainly getting your money's worth, but whichever way you look at it, $160 is still very steep. If you don't need the on the fly macro functionality, you can always get the normal edition, which is about $40 cheaper.

But even at this price, and with the learning curve involved, there's every chance that further use will see this crowned our new favourite keyboard.

A bloody good effort from Razer. **DH**

> Even before it's plugged in and in-game, just pressing the keys is an almost... well, sensual experience. Call us weird, but it's just so good!

Overall
Solid, reliable and a pleasure in almost every way.

90%

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Tron Gaming Mouse and Mat

A surprisingly good match set of mousing peripherals, despite being a movie tie-in product!

Street Price $160 Supplier Razer
Website www.razerzone.com

Specifications Mouse: 5600dpi sensor; 7 buttons; 1000Hz polling rate; 7ft cable. Mouse mat: 290 x 207 x 3mm (L x W x H).

Okay, usual caveats apply – mousing and similar facets of PC/human interaction are idiosyncratic at best. When we say we love a mouse or something similar, your own personal mileage (much like your own personal Jesus, for Depeche Mode fans) may vary.

All that said, we're going to come out and say it loud – we fracking love Razer's Tron-branded mouse and mousepad.

We know! It sounds ludicrous even to us that a cheesy movie tie-in could be good, let alone one of the best things we've ever used. But the proof is in the pudding. We ran Call of Duty 4's killhouse training level a lot, over a few days because we couldn't believe it, and we consistently ran not only our best times, but also scored our best accuracy scores with the least amount of rounds consumed.

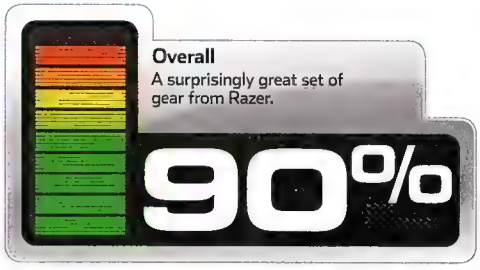
Frankly, we're baffled.

Perhaps it's because mouse and mat have been hand-matched by Razer artisans... or something. It's certainly one of the slickest combos of mouse feet and mousing surface we've ever seen, with even a gentle nudge making the mouse slide across the surface.

In terms of design, the mouse is ambidextrous with a seemingly odd positioning of the two buttons on either side – you're actually forced to gingerly hold the mouse right over these buttons lest you accidentally activate them. Perhaps this is the Tron mouse's secret, and that careful grip is what leads to such accuracy.

Of course, the Tron-themed bling may be too much for some. The mouse emits light-cycle sound effects at startup and shutdown, and features luminescent strips that look much better on Olivia Wilde. Also dubious is the bioluminescent mat itself – a light in the mouse activates the matt to glow with every swipe of your hand. It might be over the top, but if you've got a lit-to-hell-and-back gaming rig, this could be the perfect match.

Basically, colour us amazed. It might seem a tacky tie-in, but between this and the BlackWidow we're seriously considering a complete upgrade of our gaming space. About the only thing that lets it down is the price. **DH**



Thermaltake Shock One

Another month, another entry into the gaming peripheral space from case-maker Thermaltake.

Street Price TBC Supplier Thermaltake
Website www.thermaltake.com.tw

Specifications 40mm speaker driver; 20Hz – 20KHz response; noise cancelling mic; control box; 100mW max input; 3m cable; USB connector.

We admit it – we have a large cranium. Hats perch nervously atop our editorial skull, and finding sunglasses is a chore. So before we try on a new set of phones, we first crank anything adjustable as wide as possible. We were stunned, then, when Thermaltake's Shock One fell off immediately. It seems to be built for humans on a gigantic scale, and even at its smallest extension it still feels a little large.

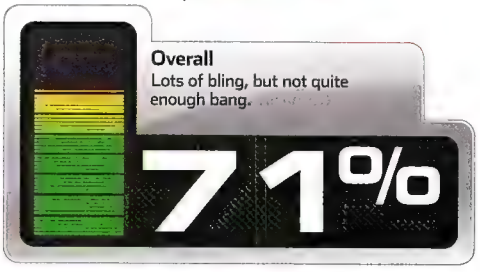
Amazing!

Also amazing is the feature set packed into these phones. There's just about everything you could want – except good, gaming-grade sound.

The Shock One headset is great at picking all kinds of subtle sound effects and musical nuances, but wraps them up in a weird echoey overall sound schema. In our testing in Modern Warfare and World of Warcraft, sounds were either muted up close, or hollow and ringing at range. Game music sounds pretty good, but listening to actual tunes delivers that same, big empty room effect.

But like we said, the Shock One's featured out the wazoo. A ten foot cloth-braided cable gives you plenty of wiggle-room, and you get spare padded covers and a bag. There's a small in-line control unit that includes a clip to attach to your shirt (or collar, or underwear, or cat), with volume controls, a mute for both mic and the phones themselves, a switch for the red lighting, and even a lock to stop accidental muting or volume changes. Feature-wise, the mic is the only real let down – it folds out of the way but is still a little inconvenient.

If sound quality's not your first demand in a set of gaming headphones, these are a well-featured option. But if real clarity's your aim, look elsewhere. **DH**



Fractal Design Array R2

A great option for a DIY NAS box, or a really basic media device.

Street Price $250 **Supplier** Anyware
Website www.fractal-design.com

Specifications 230 x 223 x 350mm (W x H X D); 4.1kg; 1x 140mm fan (front); 6x 3.5in drive bays (internal); 2x expansion slots; Mini ITX, Mini DTX; aluminium construction.

Fractal Design's speciality is delivering stylish, fully featured cases that are as pleasing to look at as they are ready for some serious tech. We were quite fond of the Define R2 Black Pearl (**http://www.atomicmpc.com.au/?175024**), and while it wasn't perfect, it certainly wasn't a case we'd kick out of the bed for farting.

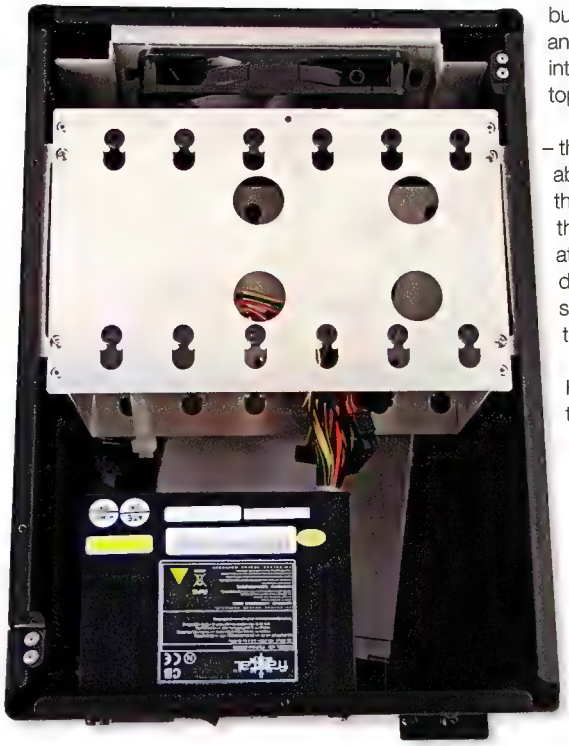
Is that okay to say?

The Array R2, however, is a wholly different kettle of fish, built to do one thing – and do it very well.

Storage is sexy

The Array R2, a slightly improved version of the previous Array design, is a storage box, pure and simple. It could be made to fit in as a very stripped down media box, but ultimately Fractal Design have aimed the chassis at the DIY NAS crowd.

Externally, it's a neat piece of kit. The all black brushed aluminium exterior manages to both be subtle and sexy at the same time. Only a single power button mars the front fascia, while the side panels house meshed vents for both the single case fan, and to help airflow over the motherboard area.



The rear is similarly simple, featuring the built in PSU, a slot for mobo IO ports, and two expansion slots. To get to the interior you remove six screws from the top panel.

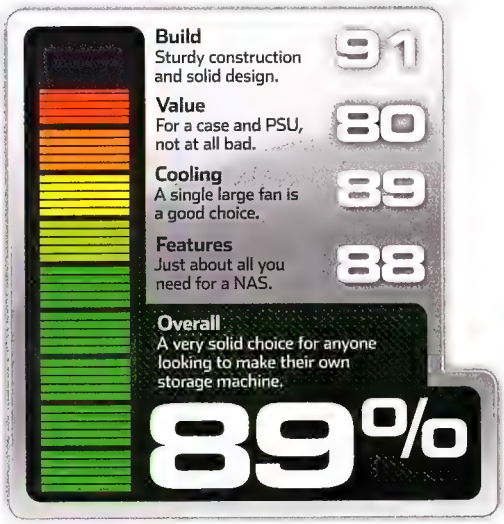
The simplicity theme follows internally – there's really not a lot to write home about. There's a single 140mm fan on the front interior, which draws air from the mesh on the side panels – which at least means you're not sucking up dust directly from the floor or whatever surface you're resting on, as none of the mesh is filtered.

Behind the fan is a single six-bay HDD caddy which unscrews to reveal the rest of the interior. The caddy is placed to get direct airflow from the 14mm fan, and features silicon grommets to reduce any vibration noise – the caddy itself also sits on rubber-coated metal brackets, so, combined with the large fan, this should be a pretty quite solution. There's even a pad of sound dampening material on the inside of the upper plate.

The Array R2 also boasts its own built-in power supply, a Fractal Design branded 300-watt jobbie which should just about be able to handle the six drives you might want to throw at it; to be honest, though, it could be a near run thing.

The motherboard, either a Mini ITX or DTX, goes onto offsets on the case's bottom surface. You could, if you really want, install video card into the expansion slots, but the best choice would be a RAID card to make the most of the many drives the case can handle.

The Array R2 is a pretty plain offering, but it's perfectly suited to the task it's designed for. It almost looks too good for a device that's likely to be tucked into a cupboard, but at the same time we'd be glad have it there. **DH**



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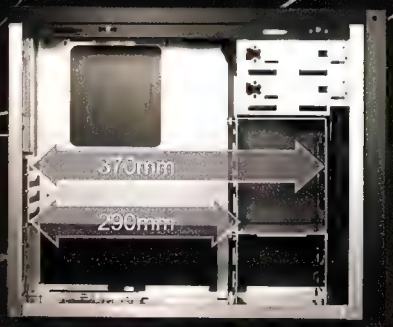
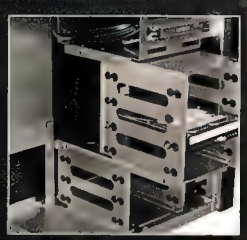
Simply elegant

PC-A04



Removable HDD cage, to exchange for room to fit full size graphics card.



- 5.25" x 2, 3.5" internal x 7, 2.5" internal x 3 (use 3.5" x 2)
- M-ATX / Mini-ITX
- 4 Slots
- 120mm x 3
- USB 3.0 x 1 / USB2.0 x 1 / e-SATA x 1 / HD Audio
- 188 x 386 x 460mm (W, H, D)
- silver / black

PC-Q08R

- 5.25" x 1, 3.5" internal x 6, 2.5" internal x1
- Mini ITX
- 2 Slots
- 1 x 120mm; 1 x 140mm.
- USB 3.0 x 2, HD Audio
- 227 x 282 x 345 mm (W, H, D)
- silver / black / red

PC-Q11B

- 5.25" x1, 3.5" internal x2, 2.5" internal x2
- Mini DTX / Mini ITX
- 2 Slots
- 1 x 140mm
- USB 3.0 x 2, HD Audio
- 200 x 325 x 260 mm (W, H, D)
- silver / black / red

PC-V354A

- 5.25" x 1, 3.5" internal x 7, 2.5" internal x 4
- M-ATX / Mini DTX / Mini ITX
- 5 Slots
- 140mm x 1, 120mm x 2
- USB 3.0 x 2 / HD Audio / Support MS/SD(SDHC)
- 251 x 317 x 420mm (W, H, D)
- silver / black / red

PC-V352R

- 5.25" x 2, 3.5" x1 (use one 5.25" to 3.5" converter) 3.5" internal x3
- Micro ATX, Mini ITX
- 4 Slots
- 120mm x 2, 80mm x 1
- USB 3.0 x 2 / E-SATA x 1 / HD Audio / Support MS/SD(SDHC)
- 282 x 277 x 400mm (W, H, D)
- silver / black / red

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extreme technology distribution

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Finest Quality Made in Taiwan

Antec Dark Fleet DF-85

It sounds like it should be something out of a Star Wars spin-off – except this new case is actually good!

Street Price $175 **Supplier** Altech
Website www.antec.com
Specifications 577 x 288 x 510mm (H x W x D); 3x 120mm fans (front), 2x 140mm fans (top), 2x 120mm fans (rear); 3x 5.25in drive bays (external), 4x 3.5in drive bays (internal), 1x 2.5in bay (external), 1x 2.5in drive bay (internal); 7x expansion slots; 11kg; 1x USB 3, 3x USB 2, audio in/out; up to standard ATX.

The Dark Fleet range is Antec's latest assault on the hardcore gaming space. It's also a result of serious brainstorming and consultation with the gaming public – in other words, it's either going to be a mess of contradictions trying to please everyone, or a highly focused, remarkably well featured beast of a box.

Thankfully, Antec's managed to land on the beast side of the equation.

The DF-85 is the top of the Dark Fleet range. In fact, we'd call it the ImpStar Deuce of the family (if you get that reference – bravo!) – large, powerfully cooled, and dramatically styled. The front fascia in particular is very idiosyncratically designed, and even Antec, when we met up with them recently, admit it's not for everyone.

Antec's gone for a barred-and-mesh motif for the case's design – plastic bars cover the optical drive bays, and swing open to provide access to drive caddies. Below these three bays are mesh inserts housing three red LED intake fans. These inserts are hinged, so the entire front fascia can be opened up. The mesh inserts can also be removed for washing, which is great. Finally, the front fans also feature fan control knobs. The fans are also hinged, as the DF-85 boasts a total of four internal swappable bays. There's another 2.5in hot swappable bay just above the IO ports on the case's leading edge, as well – if you're often borrowing friend's drives, or attend a lot of swap meets, this is an awesome amount of flexibility.

The left side-panel features two in-set windows, while the right panel more simple. The rear of the case is heavily meshed, with two water-cooling grommets, two more LED fans, and seven expansion slots – though one of these is dedicated to a USB 3 pass-through. On top of the case are two more fans, this time a slightly larger 140mm design, and non-lit.

On the interior, we're treated to a blackened interior and a lot of room. Also, returning to the swappable drive bays, the mounting points can be unscrewed and moved at any point in the bay area – a nice touch. There's also a mess of room behind the mobo plate – we can almost stick our entire hand behind there, so snugging even thick power cables out of the way should be easy. There are a couple of other cable cut-outs, and a large CPU cut out to make heatsink installation a breeze.

Annoyingly, while there is a dedicated SSD mount on the case's bottom, the HDD mounts are a little lacklustre. HDDs are secured by a single screw and a tension bracket – there's no sound dampening in play. Of course, if you want to use these bays to swap drives in and out, you'll just be relying on the tension bracket.

The PSU, though, is mounted on rubber supports, so at least that box is ticked.

The Dark Fleet DF-85 is a solid and well-made case, with plenty of room for anything you might want to throw at it, and for the modest asking price you're getting a lot of cooling and high-end features. We think Antec's on another winner with this new case. **DH**

Build 92
Solid and airy, with lots of management options.

Value 93
Surprisingly well priced.

Cooling 95
Any more fans and it would move under its own power.

Features 90
Not perfect, but pretty close.

Overall
Another top of the line effort from Antec.

92%

Acer Predator G5910

Like the chameleon, it uses the jungle.

Street Price from $2399 **Supplier** Acer
Website www.acer.com.au

Specifications Core I7 2600K, 4GB DDR3; GeForce GTX 470; 2 x 1TB HDD; Gigabit Ethernet; DVD Supermulti; Card Reader; Hot-Swap Drive bays

Every now and then it is good to check in on what's happening in the premade gaming system space. Let's face it, you're reading Atomic, so you probably have a pretty good idea of how to build a PC, and can do so with your components of choice at a price that is likely cheaper than a big name manufacturer like Acer can deliver.

Acer's Predator lineup has traditionally differentiated itself (and justified its price tag) with outlandishly articulated design – the X58-based systems have a giant, hinged door made out of orange aluminium, for example. The G5910 however is slightly less flamboyant, settling for a vertical black and orange striped front of glossy plastic, with claw like doors and a small flap covering hot-swap hard drive bays.

That makes it look like a shiny tiger, which is a Predator – making for a synergy there that must have had designers high-fiving around the office. But the flamboyant design is confined to the front of the Predator – the side panels are fairly drab, with holes for ventilation and little else.

Take the side panel off and the system looks very plain indeed. We're so used to cases with side panels, and the need for good cable management that the miscellaneous bundle of cabling that hangs in mid air looks a bit messy. A duct that bolts under the vents on the side panel feeds cool air to the processor – it works but seems a little inelegant.

Thankfully Acer hasn't made the bizarre mistake of putting the system drive in a hot swap bay like some of its predecessors. Instead the system drive is mounted internally and there is a hot swappable secondary drive.

Inside the case sits a decently specced gaming system, with a Second Generation Core i7 2600K processor, 4GB of DDR3, Geforce GTX 470 and two 1TB HDDs. It runs Windows 7 Home Premium 64-bit and comes with an array of preinstalled software that most gamers won't use. It isn't how we would spec up a gaming system – one could easily get away with a second gen Core i5 – and from our testing of Sandy Bridge motherboards and processors we know that that the graphics and CPU combo will end up with a lot of games being GPU limited.

With this in mind we threw our normal battery of gaming and processor tests at the G5910. In Crysis the system managed an average of 35.67 fps, a few frames slower than our identically specced testbench. In fact, across the board the scores were consistent with what we had seen from both the Core i7 2600K and the Core i5 2500K in Crysis.

Games in general were eminently playable, but performance was nothing outstanding. In Unigine we saw an average 32 fps with no tessellation and 20 fps with it set to extreme, while in 3DMark11 the system managed a performance score of p4178 and an extreme one of x1323. While the Predator G5910 is a decent mainstream gaming system, it could be so much more with some tweaking of specs.

If you're in the market for a premade gaming system and find the Predator aesthetically appealing then this is an adequate offering, but the balance of components is a little off. The Core I7 2600K is a great processor, but doesn't shine when paired with a GTX 470. The GTX 470 has been superseded by the 570, which offers better performance while keeping much cooler. We also noted that there were no USB 3 ports on the system, which is unforgivable when even budget Sandy Bridge motherboards are sporting at least two of these ports.

All of these points combine to make the Predator seem somewhat average when compared to other options. Add to that a price tag from $2399 (as per pricing available for the G5900 series) and this becomes a very hard system to recommend. **JG**

Performance 82
Generally good but held back by the video card.

Value 50
You can get better performance for less.

Features 61
No USB 3 in 2011 is a massive oversight.

Build 63
The front is striking but the rest is meh.

Overall
Any Atomican could build better.

64%

PCG4M3R Soldier V5

A solid mid-range system with lots of room for upgrades and future tinkering.

Street Price $1650 **Supplier** PCG4M3R
Website www.pcg4m3r.com

Specifications AMD PHENOM II 965 3.40 GHz Black Edition CPU, overclocked to 3.92GHz; A-RAM 4GB (2x 2GB) KIT DDR3 PC-12800 (1600MHz), PRO series; GA-890FXA-UD5 motherboard; HIS-6850-1GB video card, overclocked to 850MHz); 2x Silverstone Suscool 120mm Sky Blue Fan; Antec Six Hundred; Sony SATA Black Internal DOUBLE Layer Multiformat DVD drive; Corsair Force Series 60GB SSD, Samsung 1TB Spinpoint F3; 650W Corsair PSU.

This is the first system from indie builders PCG4M3R we've had in the labs, and while we may giggle at the outfit's name (l33tspeak – really?), there's no doubt that PCG4M3R has a solid lock on what makes a good build.

Perhaps the most interesting thing about these guys is they're not a reseller in any way, so they're not locked into choosing a part purely because they need to keep a vendor happy – instead, PCG4M3R can choose whatever it considers to be the best parts for a given price-point and purpose.

And thus, we have the Soldier V5, an AMD-based system aimed at some serious mid-range gaming.

The Soldier's firmly armoured in an Antec Six Hundred case – a decision we certainly can't fault. It's a bold design with solid cooling options that scored an 84 per cent back in issue 110. It also has a side window, and the view inside is seriously tantalising...

The Soldier features a very neat interior. Cables are routed behind the motherboard, or tucked away into spare drive bays, while everything else is tied down and similarly unobtrusive – not a lot at all to get in the way of airflow or to pick up dust. There are some niggles – a loose power connector just hangs in the air from the PCIe cable, and there's a length of cabling secured by one of those plastic wrapped-wire twists you sometimes get on bread – which doesn't seem ideal.

But there's a lot of well-considered hardware in here too. The heart of the system is a Black Edition AMD 965 chip, on a Gigabyte board backed up by 4GB of A-RAM, um, RAM. None of this is great stuff, to be sure, but consider for a moment the name of the rig – this is a machine that can ably Soldier its way to performance. There are better AMD boards on the market, but this will get the job done.

The graphics side of the equation is handled by a HIS 6850 card with 1GB of DDR5 memory. Both the CPU and video card come overclocked, too, which certainly amps up the performance stakes. The PSU is a 650 watt Corsair model, and cooling's handled by a brace of Silverstone fans, which not only push a lot of air to achieve positive air pressure inside the case, but are also very quiet.

But what about the performance?

Annoyingly, we've recently updated most of our benchmarks, so we can't draw too many direct comparisons. However, the Soldier's slick enough to blow away stock performance compared to other 6850-powered systems. It's not up to full Tesselation load in Unigine's Heaven benchmark, delivering 14.6fps on average, but untesselated it pulls down 28fps. That's three to four frames per second from a stock 6850 on a similar Intel system. In Crysis, it manages just below the optimum 24fps – and that's at 1920 x 1200 and with all settings maxed out. With a bit of tweaking, this still demanding game would be more than playable.

This system isn't going to set the world on fire, and nor is it one we'd build ourselves. However, for a complete package it's a decent performer, with good cabling and overclocks, and a pretty good price, too. It does come without an OS, but who doesn't have one of those lying around these days? Good job, PCG4M3R, even if we do hate typing your name. **DH**

Performance 81
Quite decent for its spec.

Value 86
A good buy, with all the tweaks.

Features 89
Just about everything you could want.

Build 87
Mostly good cabling, good 'clocks.

Overall
A good choice for a first time system.

84%

KITLOG

These are our four basic systems, with something for every taste. On this page, **The Game Box** is put together with money-saving in mind, but also an eye to getting as much bang for buck. Our build has jsut gotten a little more expensive, but for that few hundred you're also getting cutting edge performance and one of the most overclockable chips you can get today.

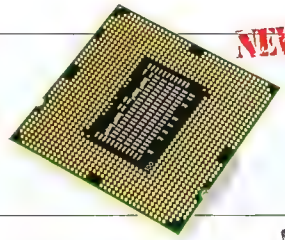
If you're going to spend money on a beast that generates pixels, you might as well spend a little more and get a screen that shows those pixels in their best light. This screen is that beast, and the 24 inches of colour-accurate screen boast a response time that will give you each sultry frame just as the game designer or movie director intended. Definitely a toy worth saving up for.

The Perfect PC, on the other hand, is the system everyone aspires to, with nothing but the best parts – without going crazy, though. It's a collection of all the greatest hardware that we'd pick without a budget, sure to impress with performance and sheer style.

Oh, and if you're wondering what the Ref IDs are, that's the ID of that article on our website. Just enter it like this – **www.atomicmpc.com.au/?NUMBER** – and you'll go straight to that review.

THE GAME BOX

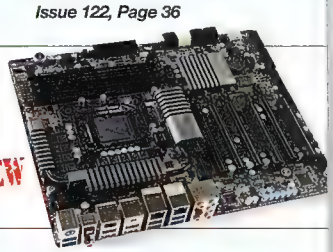
CPU



NEW

Intel Core i5 2500-K
PRICE $290
Sandy Bridge's combination of cost and overlocking prowess is awesome.
Issue 122, Page 36

MOTHERBOARD



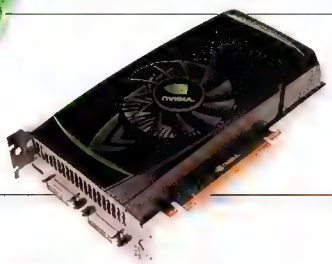
GIGABYTE P67A-UD7
PRICE $365
A great P67 board with some nice features.
Issue 122, Page 46

NEW

MEMORY

G.Skill Ripjaws F3-10666CL7D-4GBRH
PRICE $130
Great value, tight timings, and some flexibility.

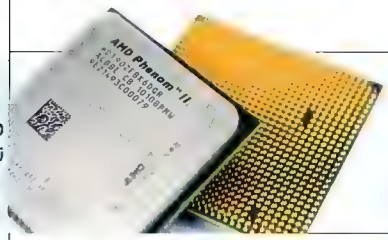
VIDEO CARD



NVIDIA GTX460
PRICE $245
A reference-design card, but plenty fast for gaming bliss.
Issue 116, Page 38

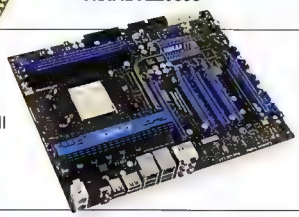
THE PERFECT PC

CPU



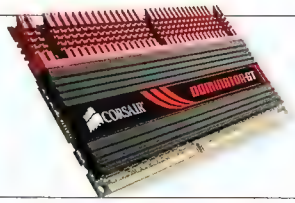
AMD Phenom II X6 1090T
PRICE $355
Six cores of high-powered processing joy.
Red ID: 220395

MOTHERBOARD



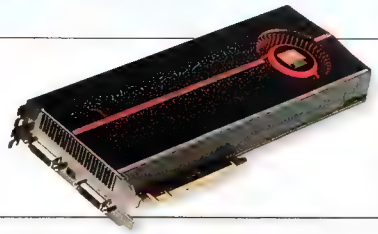
MSI 890FXA-GD70
PRICE $265
A high-end AMD platform with full CrossFire support, great OC'er.
Ref ID: 221656

MEMORY



Corsair Dominator GT CMT4GX3M2A2000C8
PRICE $220
Red-hot memory for dual-channel speed.

VIDEO CARD



ATI 5970
PRICE $780
A dual-cored DX11 beast, the most powerful yet.
Ref ID: 173167

For more builds check out the Kitlog E-mag at **atomicmpc.com.au/kitlog**

SUBTOTAL: $1890

COOLER

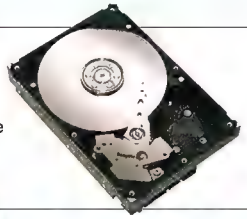
Coolermaster Hyper 212
PRICE $45

Nice cooling for a very affordable price.

CASE

Antec Lanboy Air NEW
PRICE $220

Unique looks and excellent cooling design.
Issue 120, Page 48



SYSTEMDRIVE

1TB HDD
PRICE $90

A thousand gigabyte storage drive on the cheap.

KEYBOARD

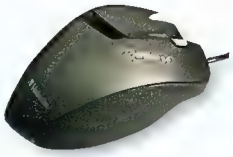
Razer Arctosa
PRICE $50

A cool-looking keyboard that'll serve you very well.
Ref ID: 149483

DISPLAY

Viewsonic VX2233WM
PRICE $215

21.5 inches of value-packed screen, great buy.
Issue 108, Page 42



MOUSE

Verbatim Rapier V1
PRICE $65

Great gaming performance and nifty features.
Issue 96, Page 43

AUDIO

Plantronics Gamecom 777
PRICE $80

Solid set of cans with great audio.
Issue 101, Page 41

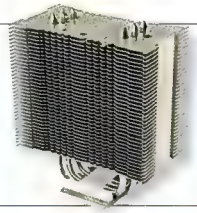
Onboard Realtek ALC889A
A decent chip that does the job.

POWER SUPPLY

OCZ ModXStream Pro 600W
PRICE $105

Plenty of wattage, reliable, modular for neatness.
Issue 109, Page 59

SUBTOTAL: $5114



COOLER

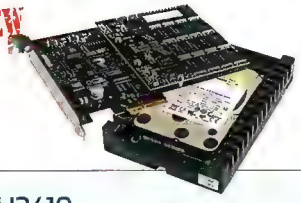
Noctua NH-U12P SE2
PRICE $95

Two fans, quiet and nice overclocking capacity.
Issue 107, Page 48

CASE

Coolermaster ATCS 840
PRICE $370

Heaps of fans, plenty of space, and dripping with quality.
Ref ID: 132479



SYSTEMDRIVES

OCZ REvo Drive x2 & WD 600GB VelociRaptor NEW
PRICE $780 + $400

Superfast SSD with zippy storage.
OCZ: Issue 121, Page 43
WD Ref ID: 220323

KEYBOARD

Razer BlackWidow NEW
PRICE $160

The new benchmark in gaming quality.
Issue 122, Page 50

DISPLAY

Dell U2410
PRICE $699

In-Plane Switching, 1.07 billion colours and 24 inches.

MOUSE

Microsoft Sidewinder X8 Wireless
PRICE $105

Cable-less, comfortable, lag-free and fraggable!
Ref ID: 148422

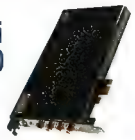
AUDIO

Logitech Z-5500D
PRICE $400

Earth-shakingly good.
Ref ID: 22626

Creative X-Fi Titanium HD
PRICE $270

Seriously serious sound.
Issue 115, Page 47



POWER SUPPLY

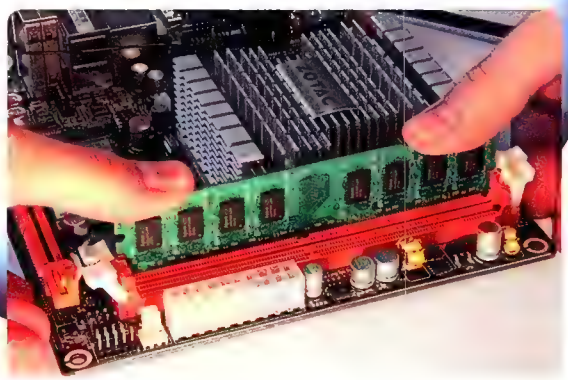
XFX 850W
PRICE $215

Plenty of power, ultra-stable rails and a great price.
Issue 107, Page 50

The **LAN Rig**, the ultimate in portable gaming power – go anywhere, frag anyone. No longer will you be tied to a desk or forced to awkwardly manhandle your full-sized rig, helped by a convenient handle and beefy tech. Perfect for wowing people at LANs, the tech inside is fast enough to run any game, and boasts enough speed to keep your game running at full clip even if other programs intrude in the background. After all, no-one wants to miss a headshot.

There are many benefits to running an ITX system, aside from the challenge of choosing compatible components, but here are just a few of the plusses:

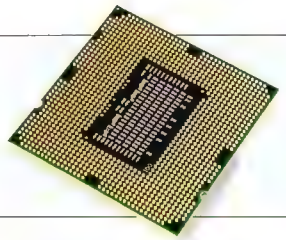
- Small footprint, so it'll fit damn near anywhere – even under a monitor.
- Lower power consumption due to restrained component choice.
- Generally low-noise due to the 'wind tunnel' design of most cases.
- Easily moveable around the house, or even taken to a mate's place – all you need is power and a screen.



Finally, for the more entertainment-minded – and really, that's all of us – there's **The Mini**, ready to play movies and music quietly and efficiently. The basic guts are fast enough for general tasks, and the IGP can handle High-Definition content. You can also choose from three entirely optional upgrades to suit your needs best: a graphics card for WoW, TV tuner to catch the game, or a Wireless card to sync without cables. The perfect energy-conscious build.

THE LAN RIG

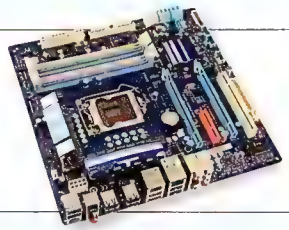
CPU



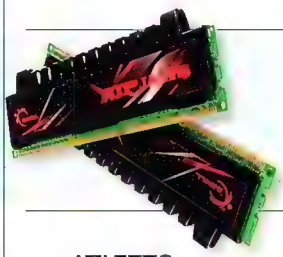
Intel Core i5 760
PRICE $245
Intel's budget quad is more than you'll need in a chip!
Issue 106, Page 36

MOTHERBOARD

GIGABYTE P55M-UD4
PRICE $200
Great overclockability, nice value.
Issue 107, Page 40



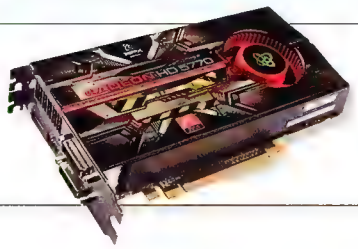
MEMORY



G.Skill Ripjaws 2000MHz
PRICE $190
Great value memory with amazing overclocking.
Issue 106, Page 52

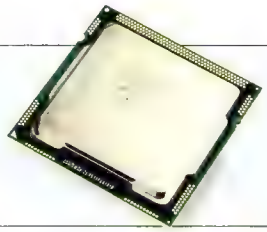
VIDEO CARD

ATI 5770
PRICE $190
A decent value way to get into DX11.
Ref ID: 169775



THE MINI

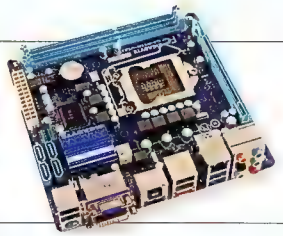
CPU



Intel Core i3 530
PRICE $140
Speedy dual-core with an IGP for HD video duties.

MOTHERBOARD

GIGABYTE H55N-USB3
PRICE $145
Tiny ITX form factor with up to 4 storage devices. Neat.
Issue 113, Page 39



MEMORY

G.Skill Ripjaws F3-10666CL7D-4GBRH
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4GB of fast memory is plenty for running multiple HTPC media streaming apps.

VIDEO CARD

ATI 5570 Low Profile
PRICE $100
Graphical grunt in half the space. Enough for basic games, given the size.

OR

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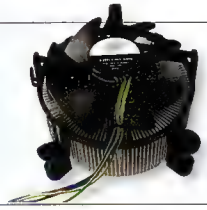
SUBTOTAL: $1655

COOLER



Intel Stock Cooler
PRICE FREE

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CASE

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PRICE $160

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Ref ID: 148266

SYSTEMDRIVE

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PRICE $90

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KEYBOARD

Razer Arctosa
PRICE $50

A cool-looking keyboard that'll serve you very well.

Ref ID: 149483

DISPLAY

Viewsonic VX2233WM
PRICE $215

21.5 inches of value-packed screen, great buy.

Issue 108, Page 42

MOUSE

Verbatim Rapier V1
PRICE $65

Great gaming performance and nifty features.

Issue 96, Page 43

AUDIO

Plantronics Gamecom 777
PRICE $80

Solid set of cans with great audio.

Issue 101, Page 41

Onboard Realtek ALC889A
A decent chip that does the job.

POWER SUPPLY

Corsair HX-520
PRICE $140

Modular, efficient and keeps size manageable in cramped case.

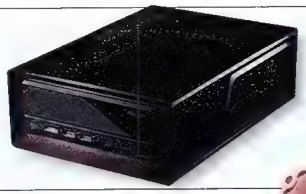
SUBTOTAL: $1033

COOLER

Scythe Big Shuriken
PRICE $55

Tiny 58mm height, quieter than a sponge.

CASE



Antec ISK 300-150
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SYSTEMDRIVE

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COOLING

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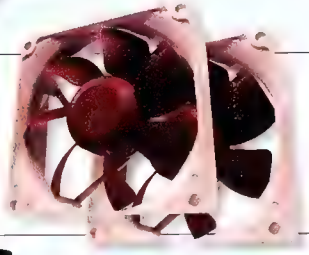

OPTICAL

Lite-On DS-8A4S
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Slim internal DVD drive for movies, installs or backups.

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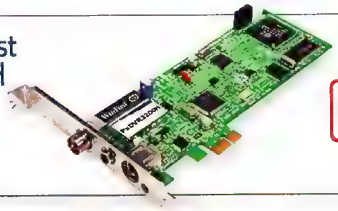

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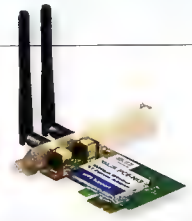
Zippy 802.11N for wireless HD video streaming.



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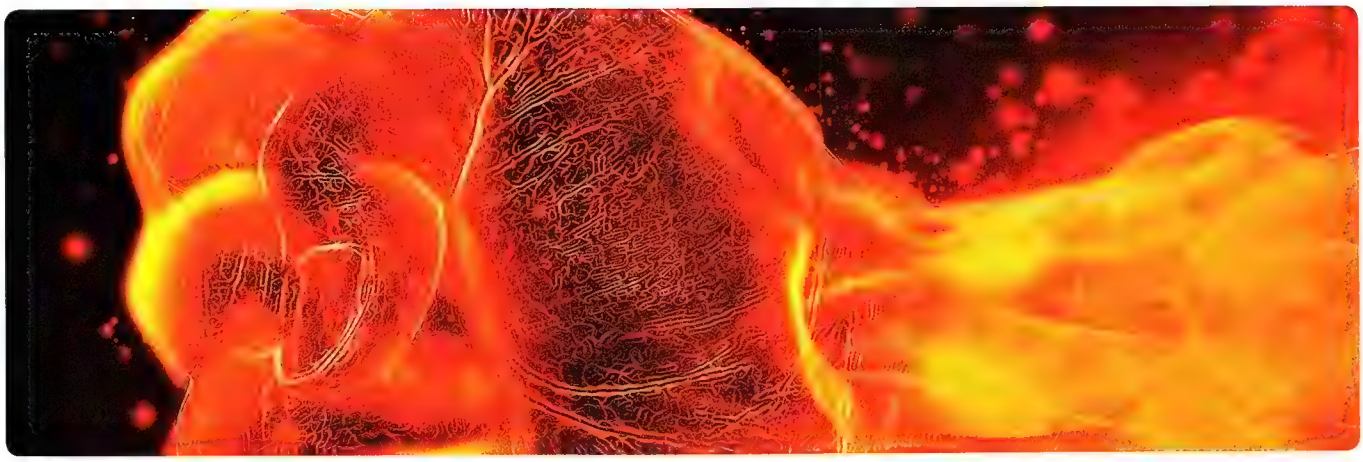

How to play a game

Dan Rutter ponders the imponderables of gameplaying behaviour...

It's surprisingly difficult to find out what people really like.

The publishers of this magazine, for instance, have only a hazy idea of how many people read it, and how much attention readers pay to the different articles, and the life-sustaining ads.

You'll find similar weirdness in every other medium that lives off ad money, including commercial TV, newspapers, and Web sites.

With Web sites, at least, we can look at server logs and see exactly how many times each element has been requested. Caching blurs the numbers, but the Guess Factor is smaller.

Tracking software-user behaviour is even more accurate.

Lots of programs phone home regularly, so the mothership knows that 43 per cent of listeners use random play, or that nobody ever seems to use that amazing new word-processor feature that took months to develop. And now there's *player* tracking, in games.

MMOs always track you, because everything happens on central servers, and they have to catch griefers and cheats.

But player tracking has much more to offer. The publishers can see, for instance, just how alarming is the percentage of people who never make it to the end of the game. They can see what kinds of characters people play, what things they do a lot, what things they almost never do, what special secrets almost nobody discovers, and so on.

Unless you're worried that the anonymising isn't very good and other people might find out how much time you spend sniping old ladies or selling faithful companions into slavery, player-tracking is not, in itself, a big problem.

The concern, rather, is what effect the data will have on future games.

Suppose a game company discovers that almost nobody makes it to the end of their game. The light-side response to this information might be to, well, just make the next game more *interesting*, reduce padding and level-grinding, add a 'casual' difficulty level, and so on.

The dark-side response is simpler. If only a few people finished Generic Manshoot 1, clearly one should only expend any effort on the first half of Generic Manshoot 2. The end-game can be a bunch of repetitive corridors containing palette-shifted versions of previous baddies. Final cinematic? Nah, a wall of text'll do.

Fortunately, I don't think this is actually a major problem.

Several big-name studios already make linear, samey games filled with nice safe slight modifications of stuff from previous games. Look at the endless parade of shooters that all, now, have single-player campaigns which are now only slightly more interactive than *Dragon's Lair*. They're big! They're loud! They're Interchangeable Blockbuster Movie Games!

Thankfully, the existence of interchangeable blockbuster movies has not stopped the creation of interesting films, any more than Madonna and Metallica have prevented the PC-driven explosion of the high-quality, home-made music that's on the Web now. And, similarly, the outrageous horsepower of modern PCs means indie game makers no longer need to be godlike programmers to make a fantastic game.

We've already got motion-capture hardware you can buy for $200 at Dick Smith, and synthesised orchestras, singers and speakers. At the moment, stitching it all together into something that'll let you make a 'big' game in your bedroom is pretty much impossible, but this situation is changing fast.

We're already seeing some great home-made projects. They're mainly mods rather than whole new games, but the bigger mods pretty much *are* a whole new game already.

So if the big studios want to market-research their way to games with all the wit and creativity of reality television, who cares?

Pretty soon, some bloke down the street'll make something better for you to play.

... just how alarming is the percentage of people who never make it to the end of the game...

Dan's always game for a... game. Uh...
dan@atomicmpc.com.au

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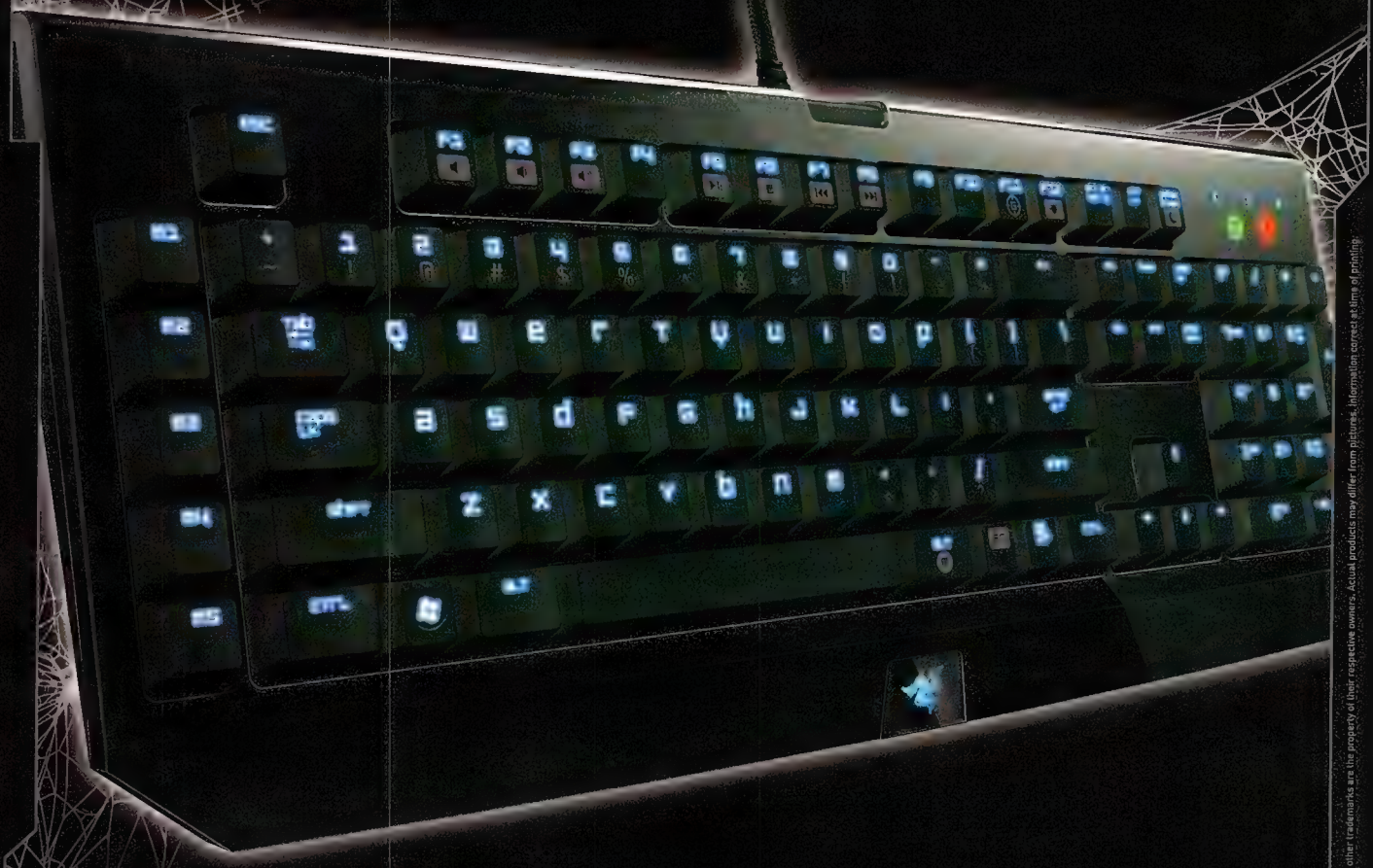

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TUTORIAL

HANDS-ON TUTORIALS FOR THE TECHNICALLY MINDED

What with how much everyone goes on about it, you'd be forgiven for thinking that without a university degree you will never, ever get into your chosen field. And that might well be true if you want to be, say, a doctor – they don't let just anybody cut people open any more (legally, at any rate).

But it might not be so true if you're looking to get into IT, and this month Chris Taylor takes a look at when that piece of paper is absolutely essential, and when you might be better off working your way up with the odd course on the side. Be warned: there are some parents out there who might not want you to see this.

Also this month, a guide to getting your gaming space to play nicer with your body, because being a twisted up old gamer with an osteo habit is really not all that much fun.

Trust us, we know everything. Nearly.

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Good gaming ergonomics.

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Get the best out of Black Ops.

atomic MAXIMUM POWER COMPUTING WEEKLY NEWSLETTER

Keep up with the latest from Atomic!

Atomic isn't restricted to the pages of this magazine, and there's still plenty more to be had online. Make sure you grab the latest content, competitions and posts straight from your favourite mag by signing up for the weekly newsletter – it's what we would do!

www.atomicmpc.com.au/signup

Do you like building systems?

Are you keen to always know the best hardware for any PC build or rig? Then you need to check out our new KitLog eBook, a quarterly online publication dedicated to showing you the best gear for more than a half-dozen PC projects.

Only available at www.atomicmpc.com.au/kitlog

Do you actually need to go to university?

Chris Taylor asks the question that no-one else will.

Looking back over the past couple of years worth of atomic.edu articles, we've noticed an obvious bias towards university. TAFE has been mentioned and the value of experience is always acknowledged, but we're wondering if we've overemphasised the importance of going to university. After all, is it really necessary to go to university to get into the information technology industry?

Well, no.

Now before you jump on that point and scurry off to the feedback section of the forums to tell us we couldn't be more wrong, let us clarify that statement. You don't need to go to university for some jobs. While having a degree makes getting most jobs in most companies easier – and certainly helps with advancing up the food chain in most companies – it's not strictly necessary all of the time. For many jobs, a TAFE certificate or diploma is all that's required. For many networking jobs, experience and ability – coupled, perhaps, with relevant vendor certifications such as Cisco certificates – is all that's required. Even for some – note the *some* – development jobs, experience and ability mean a lot more than a piece of paper.

A degree isn't so much about giving you vast amounts of practical knowledge, but rather giving you a grounding in the theory behind a discipline. Conceptual knowledge over procedural knowledge – that's university. That theoretical knowledge is undoubtedly a good thing, whether you're a coder or maintaining a couple of primary schools' networks. Most employers obviously regard it is as important, but plenty will say they rate demonstrated practical understanding of the material over book smarts. It's very possible to come out of a three or four year degree, even out of a Masters programme, with all the right answers to the exam questions but no capacity to put that theory into practice and do something tangible.

Okay, we've talked around the question enough. Let's get specific. Say you want to get into an entry-level networking gig. Do you really need to do a three or four year long Bachelor degree first? Not really. There are decent TAFE courses available that will give you a grounding in both the theory and the practical side of setting up and maintaining network hardware and software. Furthermore, there are the afore-mentioned vendor certificates such those offered by Cisco. Many TAFEs and some universities offer these, either as part of a diploma or degree or as a standalone programme. Some certifications, such as the Microsoft Certified Systems Engineer range, are very expensive but generally well-regarded. It's possible to find employment, particularly in networking, with no more than a Cisco certificate to your name, so long as you clearly know what you're talking about and have the practical ability.

For coding gigs, it depends. As much as some employers will take someone who fits into the team and has a proven ability – shows off a few things they've made themselves, knows what they're talking about – many will expect to see a piece of paper too. Of course, someone who holds a lower level qualification but clearly knows what they're on about will do better in a recruitment situation than someone who has a higher-level qualification but has no practical ability. Our advice is to couple whatever qualification you do with some experience. Try and get an entry-level job somewhere relevant while you study. If you're doing a games development course, put together a couple of fun puzzle games while you're studying. This sort of thing proves you know what you're doing in a way a piece of paper doesn't, and also gives you experience in your field, which is desirable to any employer and will give you an edge over other graduates.

Qualifications will usually bump you up a pay grade or two. You may get a job without any qualifications at all or with just a low level qualification, but don't expect – unless you have many years of experience, perhaps – to get paid as much as someone with a flashier piece of paper. As a general rule, while practical ability is the most important thing of all, even to employers who really want to see that you have good marks in a high level qualification, pieces of paper give you more money and open more doors for you. Depending on what you want to do, how far you want to advance and what kind of company you want to work for, these pieces of paper may need to be issued by a university.

There is no hard and fast rule.

So let's say you decide not to go to do a degree or diploma. Perhaps you're figuring you'll try out the industry for a few years first, to see if it's worth investing several thousand and a few years in a tertiary course. What are your options?

As mentioned earlier, there are the vendor certifications such as those issued by Cisco and Microsoft. These certifications are valued but are, in general, very expensive to get. Which certification(s) you do depends entirely on what you want to do. Look at job ads on websites like **seek.com.au** to see what you need to have to do what you're interested in. If you want to work with Microsoft gear, you should obviously be looking at that company's range of systems engineer certificates. You can study for and attain certifications through TAFE and some specialised institutes – Google will point you in the right direction – but it's also possible, at least with some of them, to buy the prescribed textbooks online, study the material at your own pace and pay only to sit the exams. You miss out on the practical workshops but if that sort of study works for you, you can save thousands of dollars.

You could also look into a traineeship, although this an option that is usually open only to those fairly fresh out of school. A traineeship is like an apprenticeship – you work for next to nothing for a while and eventually come away with a Certificate II, III or IV in Information Technology or something similar plus experience and, depending on your ability and where you're working, the opportunity to stick around as a full-fledged employee. Traineeships can range in length from a few months to a couple of years.

This path can work well if you land in a nice company or government department and can deal with the crappy pay, but it's just as likely, if not more, to see you work as a slave, almost, doing stupid amounts of work for chicken scratch. The kind of experience you get may or may not be valued by potential employers. If you're in a government department or large company you might be okay but if you're just assembling and repairing computers for a retailer, forget about it. Also, understand that if you already have a qualification in the field, you won't be eligible for a traineeship, no matter how long ago you attained that qualification, how crappy your marks were or how often you bothered showing up for class. Don't even considering lying about it, either: there are ways to find out if you've studied before. Before jumping into a traineeship, talk to the company about what exactly you'll be doing for them. Some companies, such as Telstra (well, Telstra via Excelior) post fairly detailed descriptions of what trainees do on a day-to-day basis on their websites. The low pay may be worth it if you're going to get lots of useful experience and it's a company with a lot of room for advancement.

You could also look at just getting an entry-level job. Look into work at call centres and help desks for internet service providers and the like. These positions can serve as foot-in-the-door. Keep in mind, that advancement does become easier if you have a qualification under your belt. With the amount of distance education and part-time arrangements on offer by TAFEs and universities, though, it's possible to work full-time while you study so long as you're prepared to put in the effort and have the capacity to manage your time well.

So, back to our central question. It's not necessary, strictly speaking, to attain a university or even diploma-level qualification before seeking employment. There are numerous ways to get into the industry before, or while, you get your qualification (or even when you have no plans to study) and many employers will consider someone experienced or clearly very capable but with no degree to their name. But qualifications do open doors. The best situation to be in is to have the ability to put your theoretical knowledge into practice, communicate your understanding and to have a diploma or degree too: this is true of entry-level jobs and it's especially true once you want to move beyond the lowest pay and responsibility grades.

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Setting up a comfortable gaming space

Find out how to set up a PC, mouse, keyboard, desk and chair for hours of easy gaming.

As we speak, there's a huge debate going on in the media and among members of our government about the nature of gaming, and its impact on our ongoing mental health. While we have pretty sharp views that there's really no such impact, there is one part of gaming that we do agree can cause you serious lasting damage.

But only of the physical kind.

We're talking about the physical setup of your gaming and computing space, from how you sit at your PC to the tools you use when you game – keyboard, mouse and so on. Making the wrong choices while you're gaming or setting up your gaming space can lead to short term discomfort and even longterm damage if you persist after your body starts warning you. A sore wrist, a tender lower back, even headaches can all presage that something not right with the state of your gaming command center.

Getting the right gear

It would be wonderful if gaming peripherals like keyboards and mice could be benchmarked like a CPU or complete PC system – but, sadly, that's impossible. As everyone's posture, handsize and usage patterns are different, the choice of these products is more a matter of subjective experience rather than hard science.

In other words, only you can work out what the best mouse for you will to be. You can read reviews and do your research, but it's going to come down to a degree of trial and error. That said, we can share our own preferences – they may not match every users, but it's a useful starting point for you to start thinking about your own gaming needs.

Having an uncluttered gaming area is important – you want a nice clean space that isn't going to trap dust (which can be a hazard in its own right), and is going to be a pleasure to be in and to use.

And since space is often at a premium, we think Microsoft's X-series is the way to go. The X-8 mouse is a superb choice because it not only is it well featured, with an array of extra buttons and a comfortable design, but also because it's wireless. Even better, it features a magnetic coupling system that allows you to easily attach the included cord and keep on playing (and re-charging) when the mouse battery runs down.

The X-6 keyboard we love because it's modular – the number pad can be attached to either the left or right of the main board, or detached entirely to save space. It has a good sized wrist-rest, too, though not so large that it dominates the desk.

Away from the keyboard

Exercise is important for everyone, but doubly so if you're going to be spending a lot of your time not moving much. And that pretty much sums up the state of the serious gamer.

We're not talking about hitting the gym four days a week and whaling on your abs, though. Rather, we mean simply making sure that you offset your hours at World of Warcraft or Black Ops with the odd walk, or maybe a trip to the pool.

In fact, just 15 minutes of cardiovascular activity will help improve your circulation. Good circulation is important, not only to improve the blood flow in your arms, aiding in keyboard and mouse activity, but also to stop pins and needles in your limbs or lower body after a few hours of gaming.

Such activity can also help relieve the tension built up over a hardfought round of Counter Strike, for instance. And, you know... exercise is just good for you!

Finally, you'll really want to invest in a good mouse pad. Again, this comes down to personal choice more than anything else, but in our own gaming setup we use a Cooler Master mat with a hard plastic textured surface. A good mouse and mat combo makes for much less effort in mouse movement, and therefore much less strain on your mouse arm.

And it just might help with accuracy, too.

Setting it up

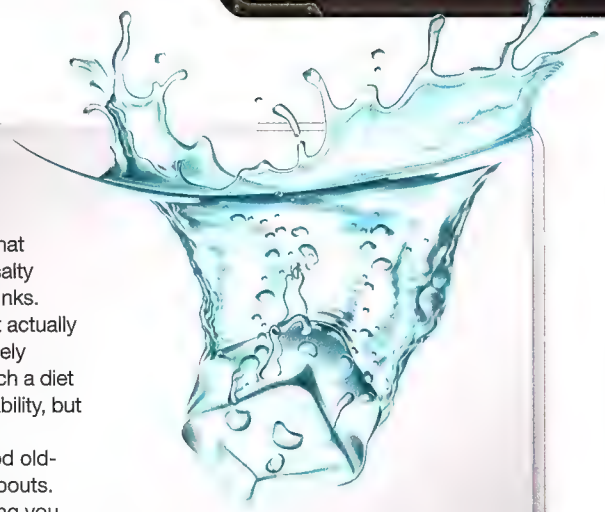
Oddly enough, if you've ever been forced to sit through a work seminar on healthy office ergonomics, you're pretty much already on track to know how a gaming setup should be rigged – after all, the physical experience of hours of gaming is little different from hours of spreadsheeting.

In short, however, you want a chair with good lower back support, which can be fully adjusted to match your height and posture. You'll want to be able to sit comfortably with your feet flat on the floor, your back straight, and your forearms parallel to your desk. Ideally, your monitor should be raised so you can look directly at it with a straight neck – otherwise, you might be tempted to slouch in your chair.

Resting your eyes is also important – arguably more so when you're playing an explosion-lit game with a lot of fast action and movement. During map reloads and pauses, look away from the screen and focus on different objects, just to exercise your eyes. If you can, get up and walk around a bit – ten minutes every hour is ideal, but any movement is better than none. Keep an eye on the ambient light in your gaming area, too – if your screen is picking up glare and making you squint you might want to think about moving your desk, or trying to alter the way it's lit.

Finally, while it might be hard to do... don't game angry. Sure, you might be playing a tense game of cat and mouse or trying to outfight an alien swarm, but try to stay relaxed. Sitting tensely at your computer for hours on end is a short path to muscle-cramps, headaches and general unhappiness.

Plus, it'll really sting when you do eventually get up, and start trying to shake out all those knots and sore spots.



What to drink

There's a popular misconception that hardcore gamers live on a mix of salty snack foods, sugar, and energy drinks. Sure, some do, but any idea that it actually gives them an edge in games is likely incorrect. One thing is for sure, such a diet can not only impact your playing ability, but it will certainly affect your health.

We recommend sticking to good old-fashioned water for long gaming bouts. It'll do a much better job of keeping you hydrated, and with a few icecubes it'll keep you cool as well – very important for our Australian summer months. In terms of snacks, you're probably better off chowing down on something like dried fruit or unsalted nuts. This will actually fuel your body, but it also serves another purpose.

The last thing you want is to be getting your fingers greasy/sticky, and then using your keyboard or mouse. It'll leave a nasty build up that makes a great home for all kinds of bacteria, and can even end up impairing the function of your input devices. Similarly, water is far easier to clean up, in case of a spill, than syrupy energy drinks.

And don't get us started on how hard it is to clean Red Bull out of a keyboard.

Last words

Ultimately, only you can determine the best setup for you. Your hands might be larger, you might be shorter, or have any number of other points of difference that mean your best setup is radically different from another gamer's. The best advice we can give is that you should try as many different items – mice, chairs, keyboards – in as many combinations as you can. Even once you've got a perfect setup, don't forget to keep trying new gear. If a friend has a new mouse they rave about, ask to borrow it; if you visit a store with a range of chairs, have a sit on a few.

Like your PC, your gaming space is something that will be undergoing constant upgrades in the search for perfection. And as you age you'll have different ergonomic requirements – your eyesight and body shape will change over time, so make sure you stay on top of those changes.

With just a bit of thought, you can make sure you can comfortably game for hours on end. **DH**

MAKE CALL OF DUTY: BLACK OPS RUN FASTER

Black Ops is the fastest selling PC game of all time – we show you how to get the best from the game without sacrificing visuals.

PRIMARY WEAPON

Your primary weapon in the fight against poor frame rates is the graphics settings menu. The range of adjustments are limited to AA, AF, Shadows and Texture Quality, which is pretty skinny for PC gamers.

Texture Quality has a large impact on both image quality and frame rate. We saw a 5fps gain in performance from dropping from Ultra to Normal Textures – lowering the setting to Low gained us another 4fps, but the game looked dreadful.

Turning Shadows off gave us a 4fps boost in minimum frame rates, but it made the game look noticeably worse, so we'd avoid doing this. It isn't worth bothering with the AF, Bullet Impacts or Bodies settings unless you have a very basic PC, as these made little difference to our frame rate.

Test kit: 2.13GHz Intel Core 2 Duo E6400, Nvidia GeForce GTX 260 (rev 1), 2GB DDR2 memory

Secondary Weapons

More subtle tweaks can be achieved by dipping into to the config file, which can be located in the Steam directory under steamapps\common\call of duty black ops\players. When changing a config file, always make a safe backup first.

seta r_multiGpu "0"

For some reason, Black Ops automatically sets itself up to use a multi-GPU setup. Disabling this option by changing the 1 to a 0 gave us a 2fps boost to our minimum frame rate.

seta r_multithreaded_device "1"

When it was released, Black Ops didn't make proper use of multi-core CPUs. This problem does seem to be fixed now but it's still worth checking the multithreaded_device setting is at "1" if you have a multi-core CPU.

seta r_specular "0"

If you need a little more speed, setting this to "0" can net you another 2fps.

seta ragdoll_enable "0"

The ragdoll physics make dead enemies fall and flail more realistically, but turning off this option gave us a boost of 1fps when there were many dead or dying enemies on screen.

seta r_blur_allowed "1" and seta r_motionblur_enable "1"

If you have plenty of performance in reserve then you can enable motion blur by setting these options to "1" – the effect isn't to everyone's tastes, and will lower your frame rate a little.

Knife

Black Ops has secret mini-games built in, which can be accessed by using the computer terminal in the interrogation room – look down at your hands while at the title screen and repeatedly press the jump button. Once free, find the computer and enter 'DOA' into the command line. This takes you to the Dead Ops Arcade game, which is a top-down shooter much like Smash TV. You can also try entering ZORK and ALICIA into the computer for other bonus content.

The best reason to buy an iPad

Your favourite technology magazine now has an iPad edition featuring everything you love in the magazine plus exclusive extras each month including additional photography and video. Change the way you view your tech. Head to iTunes now to download the app.

GAMEPLAY

GAMES, GAMING AND GEEKERY COVERED... ATOMIC-STYLE

There's a lot more to creating a good historical strategy game than might, at first, meet the eye. There's the history, for a start, and the delicate balance between getting things right and getting gameplay that works. This month's Engine Room is all about that delicate balance, and all of the history that's involved in, well, making history.

We've also got long-awaited previews of Kaos Studio's long-awaited new shooter, Homefront, and Rift, the ambitious MMO from TRION Worlds. Will either of these upcoming releases redefine and revitalise their genre? You'll have to read on to find out.

If you want your gratification a little more instant, fret not. There's also plenty of games being released right now – maybe even while we type – and we've got them all covered, in the way that only we can. Go forth and play, Atomicans!

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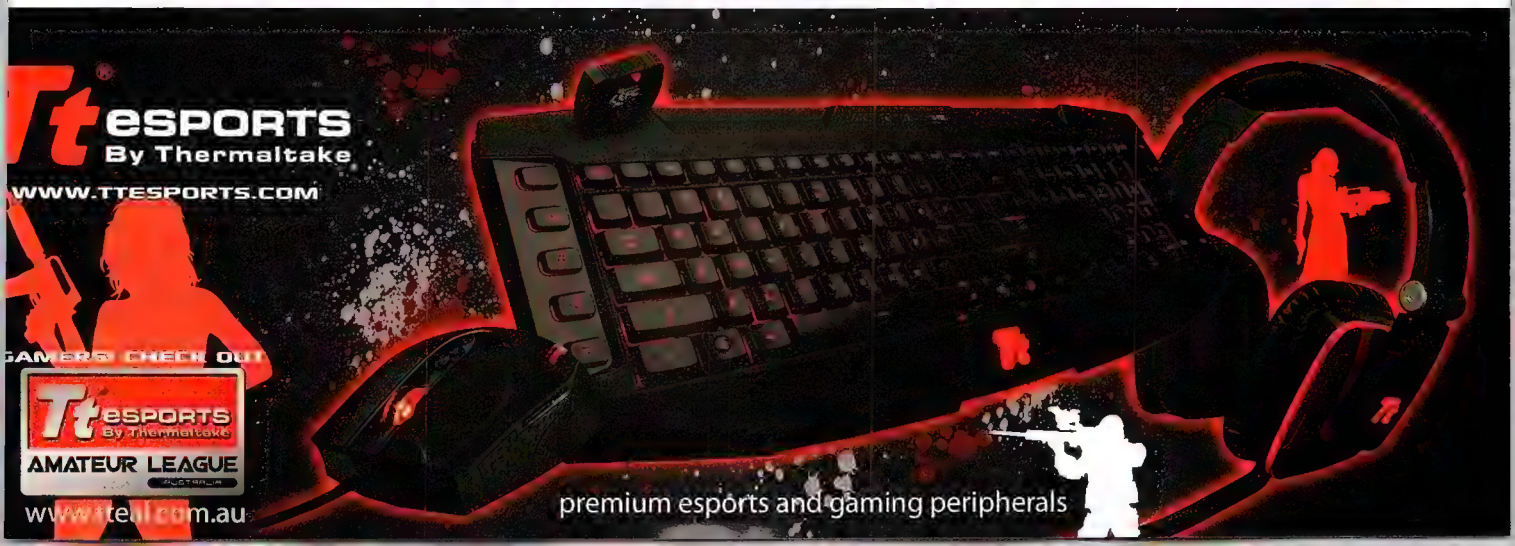


History never repeats...

Tracey Lien looks to the best of the games industry uncover the unique challenges of bring history to life in modern strategy games. Et tu, Atomic?

In the studio of Sid Meier's Firaxis Games, the development team behind Civilization V is spending the day analysing the mannerisms of Augustus Caesar. They're sifting through research documents about the Roman leader's life and character, discussing potential voice actors, and thinking of ways to capture his leadership in Civilization V's cut scenes. They'll do this for every leader who appears in the game, painstakingly trawling through the annals of history to make sure they get it right.

Meanwhile, over at Matrix Games, the developers working on a strategy title about the American Civil War have found themselves walking along an old battlefield, noting terrain features, getting a feel for the roads and obstructions, and imagining where the hex-lines would be drawn if the field were to be turned into a game map.

It seems like an awful lot of work, but the developers behind these history games feel that it's well worth it, if not to simply indulge their passion in history then at least to satisfy an audience that has kept the genre alive and healthy since its inception.

Read on to find out what makes a good history game, and its developers, tick.

ks and frames

esigner on Civilization V, Jon Shafer, told that there is a dual appeal for developing s inspired by and based on history. In st case, history acts as a way of hooking ers who are interested in events that pened in the past, and in the latter, it gives velopers a framework to work within.

The history element is an appeal for the player ecause it's something they recognise," Shafer xplained.

"If there's anything in history that appeals to you then you'll be interested in some way, and once you're interested then you'll start playing and the mechanics are such that they're addictive, so it's a combination of both – they work together."

"For developers, it definitely provides a framework we can attach things to. In more abstract games it's more difficult because you have to make things up and hope that people buy it. You have, say, a game like Brutal Legend that Tim Schafer made – nobody's really that familiar with an action adventure RPG RTS set in a metal universe – it's kind of like you have to accept that before you're even going to be interested in the game. Whereas with history, you could say you recognise George Washington, or you recognise knights in the medieval era, so there's definitely that hook."

Aside from piquing the interest of players, some developers also believe that history can be used as a challenge and a feature that enriches the game as a whole.

"The historical aspect gives game development a richness that I've really just come to love over the more than ten years that we've been developing these sorts of games," said Eric Babe of Matrix Games, who has worked on hardcore strategy titles such as Crown of Glory and Forge of Freedom.

"There's a unique challenge in trying to take, say, the whole American Civil War – the politics, the economy, the political personalities, the technological progression, the campaigns and battles, everything – and putting that in a box. It's almost its own art form."

Civilization V, Firaxis Games.

But it's not just about taking the past and turning it into a game. While history itself serves as an initial hook, developers are well aware that to keep players interested and to make their games worth playing, historical accuracy needs to be coupled with good game design to ensure that it's playable and fun. So how does one take a theme like history, where most people know how it ran its course, and make it interesting and engaging?

A different path

Eric Babe and his Matrix Games colleague, Gil Renberg, have both worked on numerous strategy history games that pride themselves on having historical accuracy and playability. They believe that their audience has an innate interest in history and thus a respect for the past is necessary, but the key to keeping them engaged lies in using history in an interesting way.

"During development, we have two goals that represent two different ways of using history," Babe said.

"The first goal is to create an immersive gaming environment, to allow the player's suspension of disbelief. The second goal is to use history as the theme, to recreate the important narrative elements for our players."

"I like to think of the game as creating a sort of sandbox for the player. When we do the research for a game, one of the things we focus on are all the limiting and boundary conditions, such as how many men could France have possibly mobilised in 1805, or what's the absolute farthest distance that a Prussian corps might have marched in a week along good roads? From this information we can build the walls of the sandbox, so to speak. Within the sandbox, we like to try to let the player do whatever they want."

Player freedom and flexibility are recurring elements that pop up when history game developers talk about ways of keeping their games fresh and new without messing about too much with the specifics of history, while also not letting said specifics get in the way of fun gameplay.

Iain McNeil, development director at Slitherine, has worked on more than 26 games, ranging from Dune 2000, to Deux Ex, Spartan,

Forge of Freedom, Matrix Games.

Field of Glory, and more recently Battlefield Academy. He believes that those interested in history games expect a certain level of accuracy – if a game or map is based on an event of the past, the locations need to be correctly named, the uniforms must be right, the setting and atmosphere should represent the period – but players also expect a game.

"What we don't try and do is repeat history," McNeil said.

"We tend to set up a set of starting conditions that are accurate, and then let the player take over. The decisions the player makes can change the way things pan out, so it's not a re-run of history; new things can happen," he said.

"We try to be accurate up to a point. If your game does not feel right people will lose interest. For example if you have a game with a medieval knight, people have an expectation about how that knight would perform against a peasant. One of the reasons historical games are so popular is that history is a brand of its own. People know that a Tiger tank is big and tough and will beat a Sherman tank frontally. If you have a sci-fi or fantasy game there is no expectation and people are willing to learn from scratch how behavior and interactions work."

Joel Billings, president of 2by3 Games adheres to a similar philosophy. The games he has worked on, such as War in the Pacific and Panzer General, have all remained incredibly faithful to history, to the point where War in the Pacific tracks every pilot that fought in the Pacific in World War II. However, Billings doesn't believe that such accuracy gets in the way of playability; rather, it provides a realistic experience that interests its customer base and, ultimately, gives players the opportunity to experience realistic possibilities.

"People play war games because they can recreate history, but also be able to change it," Billings said.

"Although history by definition had only one outcome, there were many possible outcomes… as long as the player perceives that the game is realistically weighing the important factors, there's no concern that another outcome is possible."

And it's with this approach that many developers of history games combat historical dissonance. In a situation where a player is handed the reigns, events are not necessarily going to pan out as they did in history, and so it is down to the developers to craft an experience that won't be jarring for the player. But in the case of Civilization V, a game that spans millennia, complete historical accuracy is almost impossible to achieve without interrupting the flow of the game.

The decisions the player makes can change the way things pan out, so it's not a re-run of history; new things can happen...

Napoleon: Total War, Creative Assembly.

Roman beats Aztec

"I think that in order to play Civilization and to get into it, you have to accept a certain level of historical dissonance," Shafer said.

"I've spent a fair amount of time reading what goes on on the internet and there are certainly people who say, 'I will never play Civ because it's not historically accurate'. Those are people who will not ever buy into it, but I think most people are willing to go in the other direction and accept that."

Eric Babe has experienced similar problems from players who have criticised his games for not exercising complete fidelity to history. He describes "the apocalyptic-scale debate" between war-gamers with each other over the terms "game" and "simulation", with many players disparaging games they don't like as being "just a game, not a simulation". He feels that the push for games to be so accurate that they become simulations is not something he and his team strive for.

"I regard the distinction between games and simulations as pertaining to the difference of purpose: the goal of a game is to provide fun for the player; the goal of a simulation is to

Panzer General, 2by3 Games.

solve a problem in a mathematically verifiable way," he said.

"We make games, not simulations. The games aren't fun for our players if they aren't sufficiently accurate, so accuracy is a big development goal in our games, but our games are accurate for the purpose of being enjoyable, not accurate for its own sake."

For many developers, maintaining the fun of a game as well as the sense of historical accuracy comes down to achieving the right 'feel'. Making a game feel historically accurate is an art, not a science, and it's the 'feel' that is most important to the players, says Billings.

Field of Glory, Slitherine.

Mark O'Connell from Creative Assembly talked about their approach to making the Total War series, citing that while lots of research went into making the games as accurate as possible, it was not done at the expense of fun gameplay.

"We always bear in mind that we're making a game, not a history book, therefore it's occasionally necessary to take some artistic license in certain logistical cases," O'Connell said.

"For example, in the Napoleonic era, a lot of uniforms were very similar in colour as fabric dye was often scarce. Because of this, it would be hard to tell the units apart on the battlefield if we didn't differentiate them by changing the colours. We also understand that each nation is proud of their heritage, so otherwise try to do it absolute justice wherever possible."

For many developers, maintaining the fun of a game as well as the sense of historical accuracy comes down to achieving the right 'feel'.

The team behind Civilization V also exercised artistic license in their portrayal of cultures and leaders from around the world as this made the game more enjoyable to play, without doing any injustice to history itself. Lead artist on Civilization V, Dorian Newcomb, said that one of the aims during the development process was to find out what characteristics set each culture and leader apart, and emphasise them in order to create contrast so that players could clearly see the obvious differences between the Civilizations.

"All the research that we provided for ourselves we tried to be rooted in history completely, and based off that history we try to get them as far apart from each other as possible and really push the differences between the cultures," Newcomb said.

"An example would be Catherine the Great, who is very French because the Russians were very influenced by the French in the 18th century. We had a choice of who's going to be more French: Russia or France? We decided to put Napoleon in a battlefield and have him be on a horse and really push the white red and blue that's on the flag because we thought that would be a very potent, 100 per cent French image, but not in a way that it's typically seen. We placed Catherine in more of a romanticised old world blue in her scene, and the whole point is that even though they're both French at their core and in what they appreciated culturally, they're from two different realms."

The idea that a history game should be fun is one echoed by most developers of the genre, whether the fun for their audience lies in the accuracy of the battlefields, the way a Tiger tank interacts with a Sherman tank, or the mannerisms of Augustus Caesar.

"It's always our priority to make it fun first. We're making entertainment products and it's great if there's another benefit for a lot of people, but the first point is always to make sure it's fun," Shafer said.

"If the gameplay is not good and the game isn't fun, then what's the point?"

Atomic's top five

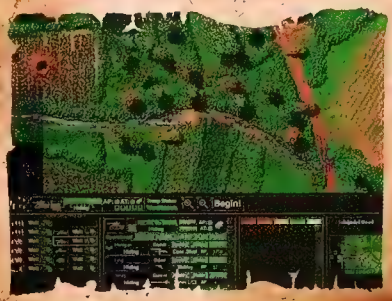
For the warnerd, computer gaming is a fabulously addictive and fascinating past time – in no other way can you refight a whole range of great battles and wars, from the time of Rome all the way up to modern battlegroups in the Middle East. We've been playing with wargames since pretty much our very first computer game, the classic hex-based Operation Market Garden.

So what are the best historical strategy games we've ever played?

Sid Meier's Gettysburg

We could rant about the flavoursome graphics and amazing attention to unit detail, the range of scenarios that covered everything from single regiment clashes up to the full three days, or even the excellent music in this great recreation of one of the defining battles of the American Civil War... But really, all you need to know is that, despite constantly losing gaming disks over the last twenty years of our adult and highly mobile life, we still own the disc for this game.

Close Combat: A Bridge Too Far



Combat Mission

Few games offer the level of combat detail that the Close Combat series does, and the second game in the series is still arguably the best (discounting the very good remake released last year).

Recreating the infamous Operation Market Garden of WW2, A Bridge Too Far covers every major engagement over the nine days of the campaign, with the balance of victory forever wavering based on your success in each battle. Soldiers and tanks are modeled on a one-to-one scale, and all rendered in – for then – highly detailed sprites on a detailed top-down map.

Combat Mission

It could be argued that Battlefront's grognard masterpiece is too close to games like Close Combat, but we think there's a vast difference. We love Close Combat for its excellent marriage of theatre-based tactics and single encounters; Combat Mission, on the other hand, focuses purely on the fighting – and in stunning 3D and meticulous historical detail.

The game's developers studied records of actual engagements weapons testing to develop their engine. Shooting a tank in Combat Mission could result in anything from the crew bailing, to spalling of the interior armour, to ricochets, explosive penetrations and more.

Rome: Total War

You can train and recruit units of flaming pigs.

Flaming.

Pigs.

Sure, the game's also a masterwork of grand strategy and a stunning achievement in engine design, but it's the ability to unleash flaming pigs that wins us over.

Victoria II

Okay, here's one we haven't played, which is bit of a cheat, but it's high on our list – and generally considered, by those-in-the-know, to be one of the best games Paradox Interactive has put together. And it's BIG. Like, kiss your girlfriend goodbye, take holidays, get a friend to mind your cat, big.

At the same time, it's also highly detailed, modeling the diplomacy and economics of the Victorian Age to a nearly slavish level. It's a game you don't so much play as live with.

Rift: The next big MMO?

James Matson risks the unimaginable threat of extraplanar invasion to bring you a Beta preview of RIFT - is it the next killer MMORPG?

There are two unwritten laws woven into the fabric of fantasy and science fiction. The first is that inter-dimensional rifts, planes, vortexes and alternate realities must and do exist in abundance. The second law dictates that these planes never contain Unicorns made from cotton candy and $50 dollar bills. Instead, they hold all manner of horrific nasties hell bent on otherworldly tomfoolery.

If there's a Unicorn in there anywhere, it's got six heads and breathes fire.

Everything from Zeb Cook's Planescape D&D setting to Stephen King's The Dark Tower series and a hundred other fictional worlds base their entire mythos around the concept of opposing planes of existence and their evil denizens, so why shouldn't the MMO genre take a stab at forming an entire game world around this tried and true foundation?

Enter developer TRION Worlds and Rift, the game formally known as Rift: Planes of Telara and before that simply Heroes of Telara.

You could be forgiven for having heard little in the way of Rift news. The game managed to slip under the radar for the duration of its development, having had – until recently – a token presence on the web and whispers in darkened corners about it being the 'dark horse' MMORPG of 2011. Fortunately, Atomic has been busy dungeon crawling our way through a few of the beta weekends, and we've returned to share our findings on what may be shaping up as a major player on the MMO scene.

All through the process of previewing Rift, we tried to keep one very important fact in the back of our minds, a fact that has the power to make or break the game. TRION has stated – clearly and repeatedly – that Rift is not an MMO designed to fracture minds with its revolutionary take on the genre. Instead, it has been built on the "solid foundation" of past MMOs, combined cleverly with just enough new content to be considered in some way unique.

The idea behind this paradigm is that Rift will

Reanimated Bones
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Brigadier
Skeletal Mage
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Bone Wolf
Bone Wolf

be instantly familiar and quickly addictive, but provide longevity through interesting and varied content. It could be considered a dangerous ploy on the part of TRION, and one that must be executed to perfection to keep Rift from being thrown straight into the '<Insert past MMO game here> clone' basket.

Those of superior intellect and deductive reasoning might have already derived that Rift is all about, well, *rifts*. We're lead to believe the world of Telara – where the game is set – was generally a pretty awesome place to be, an ancient fantasy land boasting incredible diversity and wealth of spirit. A sort of Middle Earth meets Vegas combination. That was until a magical explosion during the final days of the 'Shade War' weakened the veil between Telara and the other dimensions that surround it, causing rifts between the planes. Where there are rifts, evil denizens are sure to follow.

The player is thrown into this world as one of the 'Chosen', awakened souls given the task of fighting back the planar invasions and saving Telara from being torn asunder by beings of unimaginable power and destruction.

It's like we said: not a cotton candy Unicorn in sight.

Games got soul

Onto the game proper, and you're given a choice to play one of two opposing factions, the Guardians or the Defiant. The Guardians are your staple fantasy crew, full of old school magic and a firm belief in the Gods they serve. The Defiant – perhaps more interestingly – believe a mixture of magic and technology will be the key to saving Telara from the planar invasions. In typical MMO fashion (you'll get used to us saying that) once your faction is chosen, you'll pick a race from the handful on offer. There are standard fare like Elves and Dwarves, as well as more exotic humanoid re-workings, like the Arabian Nights themed 'Eth'.

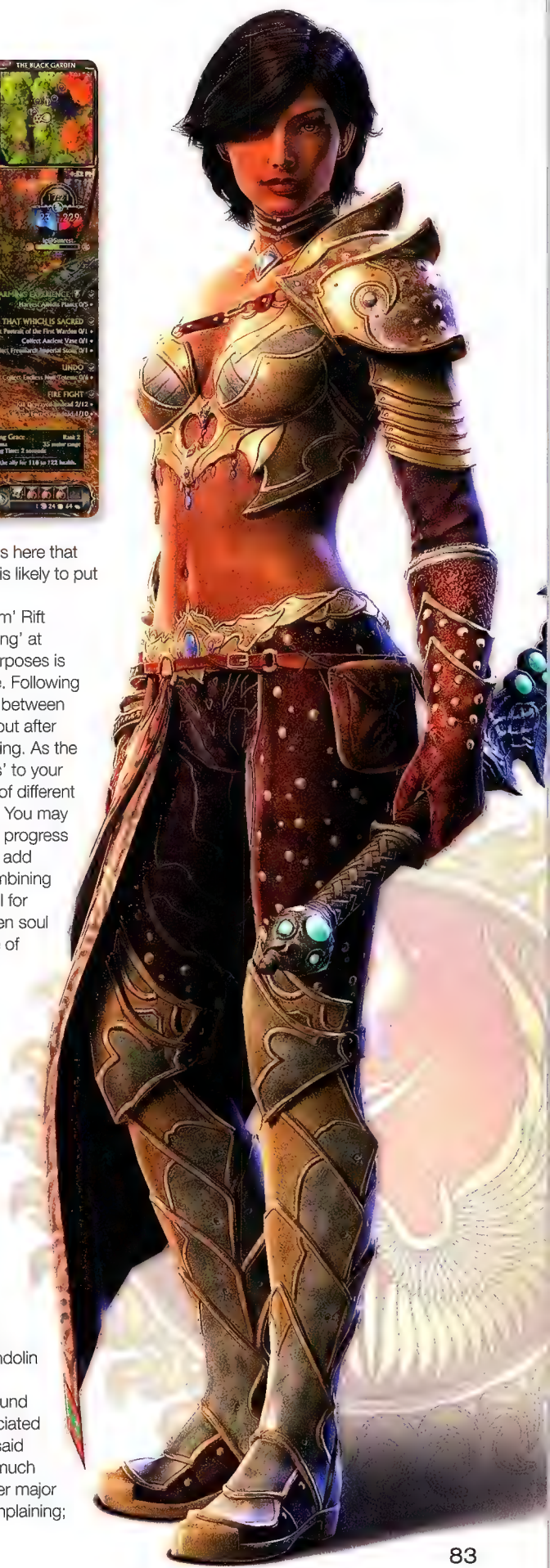
It's then time to choose the class you'll play as you defend Telara against opposing factions and the planes themselves, and it is here that Rift offers the kind of diversity that is likely to put most other MMOs to shame.

Using its 'Ascended class system' Rift allows the player to choose a 'Calling' at level 1, which for all intents and purposes is your base 'class' in MMO parlance. Following established traditions, you choose between a Warrior, Cleric, Rogue or Mage, but after that things get much more interesting. As the game progresses, you'll add 'souls' to your calling, which represent a number of different sub-classes related to your calling. You may start as a simple Cleric, but as you progress through the game you'll be able to add other 'souls' to your character, combining the Cleric soul with the Purifier soul for instance, and then adding a Warden soul to refine your character to the type of role you want to play.

What does this add? TRION is hoping a massively satisfying feeling of choice. Why be a stock standard Warrior when you can be a Champion/Warlord/Paragon, or maybe a Paragon/Paladin/Reaver? Each soul combination (there are six for each calling) comes with its own set of talents, spells and abilities with over 200 potential combinations.

Also – before you ask – yes, there are Bards. That's right, the most awesome class of all time is fully represented in Rift, so rest assured there are avenues to whip planar arse with nothing but a Mandolin and a smile.

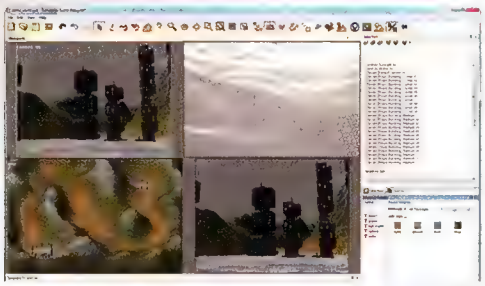
We got the chance to muck around with the Cleric calling and its associated souls in the Beta and it has to be said that the soul concept feels pretty much like the skill and talent trees of other major MMOs, but you won't hear us complaining;



Under the hood

It may surprise you to learn that the foundation of Rift, the Gamebryo engine, is far from new tech. While Rift is so visually pleasing we think we have a slight crush on it, the engine itself has been featuring in games since the Dark Age of Camelot MMORPG in 2001.

Gamebryo seems to have made itself synonymous with the massive multiplayer genre, having also been the driving force behind Warhammer Online: Age of Reckoning and LEGO Universe. There's good reason too (as Rift clearly demonstrates) Gamebryo is a highly capable game engine, supporting all the lens flares, billboarding, soft shadows, FP16 HDR, Parallax Occlusion Mapping and 3dSMax/Maya particle systems you can throw at it. It also renders some very, very cute elf women.



having six of these trees to choose from is a greedy pleasure. Once you've got all the character making sorted, you get treated to your first taste of Telara via some tutorial quests and – in the case of the Defiant faction we played – a bit of a time-travel storyline to get you to the starting area.

It's then that a few things became apparent.

This game is going to be familiar, and fast. The UI is almost exactly the same in layout and function as that most epically popular of MMOs, World of Warcraft. Quest markers, health and mana bars, experience, item/loot rarity colours – it's all going to be instantly familiar because it is more or less a carbon copy of WoW. Before the haters rise up in a fury of pitchforks and wooden paddles, we actually didn't mind this too much. We were instantly at home, we knew where things were, we didn't have to bury ourselves in tips and tutorial pop-ups. We could just get on with it.

And what a pretty, pretty world to get on with it in. Rift utilises the Gamebryo engine (the guts of Warhammer Online: Age of Reckoning if you're looking for a reference point) with technical precision, producing a lush fantasy world complete with detailed landscapes, extravagant architecture and well crafted flora & fauna.

From the moment we were thrust out into the world, our senses were delighted at the overall visuals and art direction.

The spells and buffs are crackling with a suitable level of particle goodness and lots of neat graphical touches are dotted around the place, like the techno-magical cabling that snakes its way from contraption to contraption in Defiant-controlled towns. Enemies from the rifts themselves glow with an otherworldly aura, and enemies – in particular undead – are well constructed and gorgeously textured. The only thing lacking was contrast in clothing and weapons for players and creatures alike, with a lot of the colours being variations on greys or browns, though this may be by design as players can purchase dyes from NPC vendors to re-colour their armour and clothing.

Music and sound effects are appropriately fantasy-like, with some obvious attention given to layering the background music to suit the transition from casual exploring to frantic action.

What we were less impressed with, at least thus far, are the animations. Character running and fighting animations appear stiff and graceless, while some animation sequences – like hopping onto or off the mount you gain at level 20 – are completely missing. Given that we're forgiving types, we put this to the side for a moment and pushed on to see what the world of Rift had to offer.

Dungeon highs and questing lows

In traditional MMO style, your character advances through the traditional method of questing for the most part, and the Rift quests are a mixed bag. Some are fun, engaging and worthwhile, while others are from the "kill ten bog rats, five slippery eels and one Gnoll then return to me" stable, but throughout it appears TRION has tried to stay on message and build an engaging 'struggle of Telara' story through at least some of the quests. The grind is there however; we felt it and doubtless you will too. As we spent a bulk of our time doing quests, it was slightly disappointing when we realised the entire questing system seems tightly controlled.

Dystopian George Orwell 1984 controlled.

Each bunch of level-appropriate quests are bunched together in a single location, with the last quest conveniently pushing you directly to the next hub of quests to do. We felt it was progression on rails; there's little incentive to explore, to break away from each quest hub and just wander the landscape exploring what is supposed to be a massive fantasy world.

Toe the line, do the quest, hand it in, get the next one. Rinse, repeat.

It didn't help that many of the towns and villages on the continent available in Beta had a distinctly lifeless feeling. They were beautiful to look at, but in our wanderings we only found a handful of structures we could enter and explore – most were simply impenetrable props – compounding the feeling that we were being

The Defiant faction's mixture of technology and magic is a welcome addition to the standard fantasy landscape.

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Dungeons how they should be. Epic, spooky and in desperate need of roof maintenance.

herded in a single direction and given no reason to get lost in exploration.

Thankfully TRION has thrown in a few adventuring diversions that aid in exploration, the first being 'collection quests' which amount to ancient relics being hidden randomly around the world which, when collected to a complete set, can be handed in to a vendor for rewards. The tell-tale sparkle and slight glow from the roots of a tree or the crevice of a boulder is a sign that a relic awaits collection.

To break up the questing, Rift contains both a fully-fledged crafting system and – of course – dungeon instances. While we freely admit we didn't spend a lot of time with the crafting side of things, we can report that it seems standard fare, with materials harvested from the land or dropped by bad guys able to be used to create items, potions and other bits and pieces for yourself and other players. There have been concerning murmurs from beta players who love crafting that the quality and 'strength' of crafted items doesn't match those found in dungeons or through questing, which if true could render crafting useless.

We did however, spend plenty of time in dungeons, particularly the Iron Tombs, which is the first instanced group dungeon available to players. Iron Tombs is stunningly captured using the Gamebryo engine, with shafts of light breaking through gaps in overhead stones and an overall epic feeling produced by wide corridors and high ceilings as players venture into the lair of Alsbeth the Discordant. The game play in Iron Tombs is a perfect mix of traditional creature smashing and strategising to defeat the various bosses; we had to rely on group tactics at several points during the instance to survive.

There is also a comprehensive slice of player-versus-player action. While the two factions will encounter each other 'in the wild' while travelling Telara, the real action is likely to take place in the instanced Defiant versus Guardian battlegrounds, called Warfronts. We managed to get a few rounds of Black Garden, an instanced PvP map where players attempt to possess the Fang of Regulus – accruing points while doing so – as players of the opposing team hunt the fang holder down to steal it back.

It's a chaotic frenzy from the moment you zone in, and the combat mechanics of Rift allow for fast and engaging battles between factions. The options provided by the Rift soul system also add a twist to PvP combat; it's incredibly difficult to develop strategies against a class that could be made up of any number of different soul combinations. Are you battling a Healing Mage? A high damage Cleric?

Rifts ahoy!

You were probably wondering when we'd get to rifts? Well, we saved the best for last.

At their most basic, Rifts are splits in the protective layer between Telara and the elemental planes of Life, Death, Fire, Earth, Water and Air. From these rifts spew forth waves of elemental themed enemies that must be defeated in order to seal the rift. With each wave of enemies defeated, a stronger wave will appear, usually culminating in a boss-style minion with fistfuls of health and some serious anger issues.

In the same vein as Public Quests from Warhammer Online, anyone may run in and help seal a rift (they're almost impossible to deal with solo) with no need to group up, and rewards in the form of powerful equipment, materials and tokens that are provided at the end of a rift event based on participation.

If you ignore or fail to seal a rift, things step up a notch and Invasions occur. This is where Rift takes a violent detour from the public quests of Warhammer as the planar invaders

Beating on people and other wholesome activities

Instanced PvP action is likely to be a big component of Rift, so what scenario styles does TRION have on offer with its Warfronts? These are the ones we know thus far...

Black Garden

As we've already touched on, Black Garden involves both sides – Defiant and Guardian – trying to take possession of the Fang of Regulus. While the holder of the fang accrues points for his team, the fang depletes the holder's health, meaning no one can hold it for long, even with friendly healers at the ready. The idea then, is to ensure that when the holder finally dies from fang-damage or enemy combat, a friendly player is there to scoop up the fang and continue accruing points. An interesting and frantic scenario that constantly ends with the fang holder being stacked on by a horde of enemy players.

The Codex

With a slightly slower pace than Black Garden, The Codex is a part slaughterhouse, part strategic map that involves capturing and holding nodes on the map to accrue points, with a central node in the middle of the map offering faster point accretion than any other. The geography of The Codex map is deliciously varied with mountains, rivers, bridges, small cliffs and other features to break up the action and layer the combat across the map. We didn't get a lot of time in The Codex, but we're itching to have another shot.

leave the immediate vicinity of the Rift and start tearing up the countryside. It's as obscenely awesome as it sounds.

All of a sudden you have waves of Dragon whelps from the plane of Life swooping down roads, gobbling up low level players who were just a few seconds ago meandering down the road without a care in the world. Undead wizards from the plane of Death will begin assaulting the quest NPCs of a town or village and – if left unchecked – will eventually take over the quest area itself, setting up a permanent foothold and preventing players from receiving quests until they are driven back.

How players of Rift react to the dynamic content is probably going to make or break this title, but from our perspective, the rifts were hellishly fun and the developers have given the concept a lot of attention and care.

As you approach a rift, the sky darkens, the music changes to a warlike drum-beat and the landscape begins to warp and resemble that of the invading plane. For a death rift, this means Lovecraftian tentacles and blackened earth, for a water rift it's seaweed and killer frogs.

Critters who leave the initial rift area in groups are utterly ruthless, roaming the land attacking the local fauna, players and even the beasts of other rifts. It's this last scenario that makes for some compelling game play as players seize the opportunity of a rift weakened by battling the minions of another rift to head in for the kill and seal the tear completely in the hopes of high level gear or rewards.

The rifts and their invasions create a game world where it's never safe to idle anywhere. There's no leaving your toon sitting in the middle of the road drinking water while you go grab a coffee. Do that (as we did on several occasions) and you'll likely come back to a corpse that's been utterly consumed by roaming undead. The rifts are pure pandemonium, with few safe spots for the weary player and the constant threat of invasion to bring each faction together in a common goal.

The highest form of flattery

For a beta preview, we've sure thrown a few opinions around. The reality is that Rift is set to go on retail sale in March, so much of what we've seen – the good and the bad – isn't going to change a whole lot between now and then. We can afford a few opinions.

We've come out of the closed beta feeling decidedly mixed. There's a lot of good in Rift, that's for sure. For a beta it's incredibly polished, with very few bugs that we could see; the graphics are gorgeous and the world is well fleshed out. The soul class system offers deep customisation, while the rifts provide an alluringly

dynamic angle to the game play. All of the major building blocks of a modern MMORPG are present and accounted for.

The game's success however, may well rest on two things; people's willingness to endure the restrictive quest progression (at least in the level range we saw in Beta) and their ability to look past the fact that Rift unashamedly steals its player-versus-player foundation and group objectives from Warhammer Online as well as a bundle of stuff from World Of Warcraft.

Then again, there is that old saying about stealing from thieves.

Reactions will be gauged upon the game's March 1st release, but it's open for debate whether enough MMO fans will find a reason to engage yet another new game that relies on the same basic time sink/grind of past MMOs, rifts or no rifts. Here's hoping TRION pack Rift full of enough great high level content, dungeons, otherworldly invasions and player-versus-player action so that the shortcomings we've spotted are quickly forgotten. **JM**

atomic PREVIEW

Homefront

We're making the claim now – this IS the next great military shooter.

The FPS, as a genre, is in an interesting state right now. Once the flagship of PC performance and cutting edge engine design, it now seems to have collapsed down to an endless series of real-world military scenarios ported from console releases. Sure, there are great titles like Battlefield: Bad Company 2, but they are the exception – and even then, BC2's still firmly clad in khaki.

Homefront, the next game from Kaos Studios (makers of Frontlines: Fuel of War), could easily have become just another military shooter. However, ever since our first in depth look at the game in an Engine Room back in issue 115 last year, and even more since seeing it in action last year's E3, we've been thinking Homefront's something different. It really looks like something to look forward to, to actually get excited about without that lingering fear that we're going to end up with 'just' another FPS.

We recently got to have a mess of hands on time with both the singleplayer campaign and Homefront's multiplayer game, and we're very happy to say that so far... our expectations have been thoroughly met.

Home is where the war is

Our singleplayer adventure – if that's the right word for it – began when we woke to someone hammering on the front door of our run down shack. We'd already watched the game's opening introduction – an extended version of the future history trailer that first got us really excited about the game. So, we knew that most of the USA was occupied Korean territory, and that basically the world had gone to hell in an EMP-blasted handbasket. So that incessant knocking... probably not good.

What it was was even worse. For very little reason we were arrested, hustled into a bus, chained to a seat, and then driven off for some form of re-education. What follows is basically an interactive cut-scene – you can't move, but you can look around. It's worth it, too, as this is your first impactful look at what's become of America.

It's not pretty.

The local population – the game starts in Colorado, and the entire area is ringed by mountain ranges, always visible over the roofs and buildings of all the early levels – are under the gun, literally. Armed squads of Korean soldiers patrol the streets, and dissidents and malcontents are being rounded up. In extreme cases, folks are being put up against the wall

and shot – often with family members looking on. Elsewhere, soldiers are dumping bodies in canals and sewers.

A very pretty occupation

It is a bloody and brutal introduction, perhaps a touch over the top in terms of "Hey, look, these are the badguys", but it sets the tone wonderfully. Even more important, it shows off the nature and mood of future America – everything's worn and shabby, pocked with bullet marks or stained by the elements. This is clearly a place where the usual rhythms of civic responsibility have utterly broken down.

But for all that, it's also still a very colourful place, which is more a testament to Kaos Studio's efforts with the Unreal Engine. Unreal's always been capable of putting out a lot of vibrant colours, but that's something that many devs shy away from when making a modern shooter – if it's not brown or green, it's usually not worth wasting polygons on.

Homefront, however, is not really a military shooter, at least not in the singleplayer. It's about a civilian resistance fighting in civilian locations. You've got bright posters and billboards, a deep blue sky above, and all the other colours you'd expect to see – even on the freedom fighters themselves. It's actually quite striking how colourful it all is, which only makes the grim content itself that much more striking.

Homefront, however, is not really a military shooter, at least not in the singleplayer. It's about a civilian resistance fighting in civilian locations.

You're in the resistance, now

Back to the bus, and it's not long before our trip to a labour camp – or worse – is interrupted.

By a truck totalling the bus!

It turns out that the local resistance cell needs a pilot, and you're it. Again, the form of the rescue serves to reinforce the fact that the people you're fighting alongside are not military, and nor are you. It's a slipshod affair that swings between hiding from patrols and balls-to-the-wall firefights.

You'll also find yourself swapping between weapons a whole lot, and that's another conscious decision the devs took for this part of the game. Ammo is pretty thin on the ground, so you'll always be scrounging from enemies or

hidden supply caches. At least for the first few missions, you rarely fight alone; it's possible to re-stock items like grenades from other team members once you're fully equipped.

And speaking of combat, it's pretty brutal. The game uses the now classic regenerative health system first made popular by Halo; take a few rounds and the screen goes all red and dramatic until you take cover and recover your breath. Your Korean opponents, on the other hand, can be dropped with a single well-placed shot. The combination of gritty ballistics and regeneration is a solid one, and with some fights featuring multiple waves of badguys, the sense of chaotic firefights between conscript troops and resistance members is well captured.

Of course, some soldiers have more armour than others, so it pays to go for those headshots. Death animations are suitably gory and feature some impressive rag-dolling, especially when you let fly with a well-cooked off grenade.

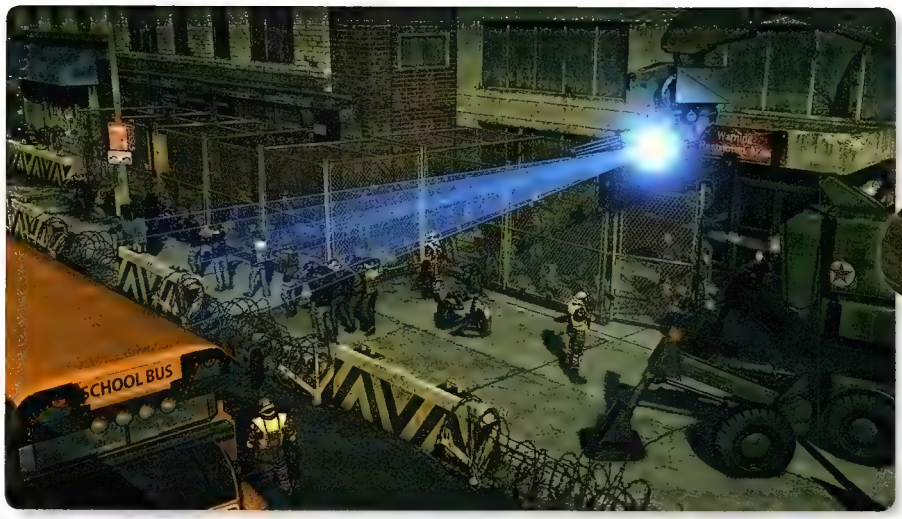
But it's the story elements of the game that really stick with you, and game's pacing is designed to give you a lot of moments of reflection in between all of the firefights. It's at these moments that you can appreciate not only the sheer detail of the world, but also little things like the game soundtrack, and the amount of effort Kaos has put into achieving a ray of dappled sunlight breaking through the branches of a tree.

There is every chance that Homefront's campaign could be the singular singleplayer FPS experience of the year.

Listen up, soldier!

Homefront's multiplayer takes a very different approach, and it's one that's pretty unique. It's almost a completely different game – you take on the roll of trained soldiers in the frontline conflicts that lead up to the annexation, not freedom fighters. A lot of modern games feel like the singleplayer experience is merely a training level for the more popular online play, but Homefront makes the two experiences two very different beasts, and tricks learned in one part of the game won't necessarily move across to the other.

Even your movement rate is different in multiplayer. As a soldier trained to cross a battlefield, you can move much faster. Just this simple difference changes the feel drastically, but as speed is often of the essence in modern



FPS multiplayer games (whether to get to objectives or simply get across ever-growing maps), it serves a practical purpose too.

At a separate hands-on event to our singleplayer session, we got to play two of the game's modes. One was a simple objective-based mission that would be instantly familiar to any veteran of Battlefield: Bad Company 2 – there were three objectives, and once held for a time, another set of objectives unlocks and the action moves along the map. We played two different maps with this mode – one that ran along a main highway with a number of overpasses and a mess of wrecked vehicles, and another that was on rolling farmland and much more open.

The other mode we played was called Mission Commander, and in this an AI 'commander' observes the ongoing carnage and hands out missions to different players. These missions are either take and hold this spot, or take out player X – based on how well certain players are going.

It's kind of like Red Dead Redemption's multiplayer, where your notoriety is both a bragging point, and a huge shiny beacon to other players to come kill you. It also works really well in a more pure FPS, rewarding good players, while also providing a fluid focus to the gameplay.

All the game modes feature a class-based load out, and weapon unlocks based on constant levelling. The classes are Assault, Heavy, SMG, Sniper, Stealth and... something else. We mostly played Sniper and Assault, and with many of the classes having access to drones to either scout the terrain or remotely assault positions, there's a mess of different gameplay types on offer.

Over all of these systems, which would be familiar to any Call of Duty fan, is the Battle Point mechanic. This is essentially an in-game currency that you can use to activate secondary weapons, or to spawn vehicles, ranging from HUMVs to attack helicopters. This is kinda cool, as it leads to somewhat of an arms race as people gather BP. There's also that constant choice – spawn as soon as you can, or hoard points for a larger, tougher tank or similar.

Once very neat function in the game's spawning system is that you can choose to spawn into an empty position on a friendly vehicle – no more madly running after armour trying to hop on for a ride!

Taken all together, Homefront's multiplayer offering is a more conventional game than its singleplayer, but it's still a lot of fun. The range of classes, the addition of mobile drones, and of course heavy vehicles and fluid objectives all make for an interesting take on modern military FOS combat. We don't think it's as strong an offering as the campaign, but it's still very good.

Almost done

According to Kaos Studios, the game is very much complete, and simply going through the optimisation and bug-fixing stages. It certainly feels finished, and given that we previewed the game on Xbox 360, we have high hopes for Homefront on PC. We've been told, straight from a Kaos dev, that it absolutely blows the console version away – and given how tightlipped most devs are when you ask them about PC, we can only hope this is a good sign.

Questions of ports and platforms aside, though, even on console Homefront is an amazing experience. We had folks from all over the office watching us play – even non-gamer's were fascinated by the game's storyline and setting. It's that rare FPS that's both emotive and fun and exciting.

And that describes us pretty well – we're very excited about Homefront, and as long as the PC Gods are smiling, this is going to be one helluva a package. **DH**

PC, 360, PS3 (previewed on Xbox)

Developer Kaos Studios
Publisher THQ
Website www.homefront-game.com

Great use of the Unreal Engine; striking story; excellent pacing.

Possible porting issues still a worry; multiplayer far less colourful than singleplayer.

Anticipation rating

Quite simply one of the most exciting looking games of the year.

89%

Breach

A low-fi entry into the online shooter market that could grow into something special.

There's something delightfully retro about Breach, the new FPS from Atomic Games. There's a kind of glow of old-schooliness to it; for one thing, Atomic is responsible for some of our favourite games of all time, like the Close Combat strategy series. Then there's the unashamedly Counter Strike feel to the entire game, right down to an eerily familiar main menu screen.

Similarly, it's got the sheen that only a labour of love can have – but, like many such labours, it's also a little rough around the edges. As an online only PC/Xbox 360 title, that costs around $20 to purchase, is the roughness okay?

Blowthrough

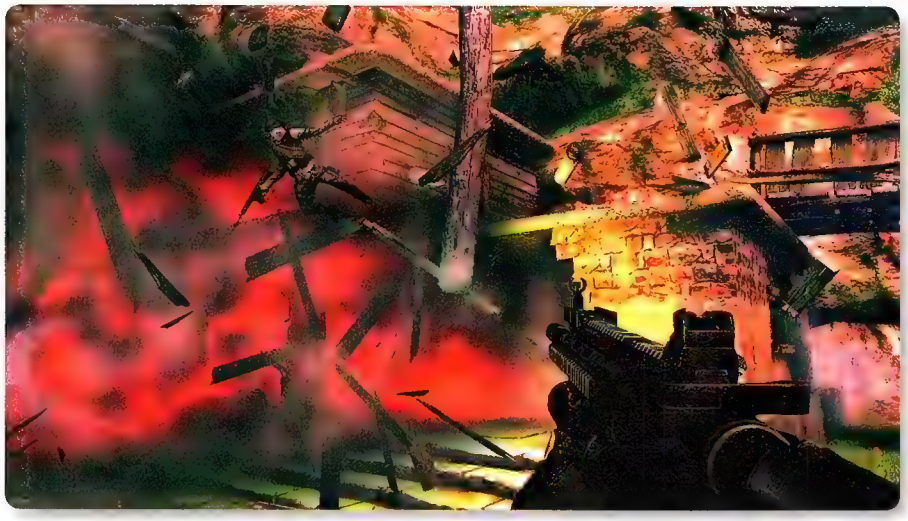
Breach's premise is familiar to anyone who plays Bad Company 2 – get the drop on the enemy by blowing the crap out of the environment. The big claim that Atomic makes over the competition is about the level of detail in that destruction. Walls can be shot out brick-by-brick to make a loophole, or support beams can be destroyed to collapse an entire structure. Floors and other architectural features can also be shot out, and many of the game's maps make use of walkways and bridges across long drops – all of which can be taken out with a well-placed rocket.

The other side of the destruction pancake is Breach's thorough weapon and gadget loadout, which can be unlocked and tweaked to please the most dedicated of shooter fans. There are five classes, from Rifleman to Sniper, and including a fifth Scout class that must itself be unlocked by progressing through other classes first.

Each weapon has an array of add-ons like scopes and under barrel attachments, and a bevy of gadgets ranging from HE charges to sniper detectors round out the game's toys.

Then there are the maps and missions. The maps are nothing to write home about – snowy mountain bases and terrorist hide-outs abound, all seemingly glued to together from a muddy brown palette – but the missions are a little more interesting. There's classic stuff, like Infiltration, which tasks you with taking five objectives, but also unique modes like Convoy, which sees one team escorting vehicles through a map, clearing obstructions as they go and manning gun turrets as the other team tries to destroy the vehicles.

But all of it hinges on the action itself, and the comprehensiveness of Atomic's so-called Destruction Toolbox. Does the team pull it off?



Almost there...

Probably the biggest problem with Breach is the lack of polish. In its original form the game was, essentially, the controversial and eventually banned title Six Days in Fallujah – Atomic's effort to recreate the house-to-house fighting between US Marines and militia in Iraq. Some of the mission-types and settings are obvious hold-overs, but ultimately the game now feels more generic than anything else.

The maps are pretty flavourless, to be honest – the game's Hydrogen engine just isn't up to showing even the level of detail that Black Ops can manage, let alone match the fidelity of the Frostbite engine. Natural surfaces are blocky and, well, unnatural, while buildings seem little more than a phsyics space waiting to fall over.

Character models, on the other hand, are really quite solid – though when you see these detailed figures striding over a blocky landscape the sense that you're playing an amateur mod rather than a retail game is even stronger. Weapon models, too, are lovingly detailed, and all based on real-world varieties of boomstick. But this is also where the game starts to show a certain class that other, fancier titles lack – once you look down the iron-sights of your M4 and start to make use of the other selling point of the game, active cover, you start to feel the love.

It's a bumpy love; a love that's going to lead to tears before bedtime and many cranky letters and nights on the lounge, but there's undeniably something going on between us and Breach. The ballistics modelling is a lot tighter than many other games, and much more grounded in real-world effects. Long range duels are as much about patience and judging the movements of your enemy as they are firepower, especially if you're playing in Hardcore mode. Combat is at one and the same time very sharp and brutal, but also a lot slower and more strategic. You might be keeping someone pinned down so your friends can outflank his position, or gingerly wondering if the wall you've just cut a loop-hole in is going to get blown out any minute – either way, the game certainly engages your tactical senses as well as your twitch reflexes.

Convoy mode in particular makes for great matches – you must not only escort and protect the vehicles, but keep them repaired and on track to get through each map, and this requires a delicate balance of offense and defense.

However, the game needs work. Sound effects, especially bullet impacts and near misses, are fiendishly repetitive and frankly more annoying than terrifying. At time of press, there are also no dedicated servers up and running – sure, you can easily create your own or rely on others to do the same, but then you're at the mercy of that session staying active. Too often we found ourselves ejected from a tense firefight because the host has shut down his or her session! Unlock progression is also very slow – even the most basic advances cost 500 XP, and as you only earn five points a kill on average, the game's deliberate pace is really too deliberate. And the game's lobby system sucks.

But at least it means the game isn't already being spammed by gren-toting griefers.

We really want Breach to succeed, and keep being supported by Atomic. Sure, it's only $20 – less on Steam right now – but still, we've seen mods that have more solid and reliable content. It's a good start, but possibly not quite there yet. **DH**

PC, Xbox 360 (reviewed on PC)

Developer Atomic Games
Publisher Atomic Games
Website http://breachgame.com

Gameplay 74
Great ballistics, but many niggles.

Graphics 71
Workmanlike at best, but the destruction is impressive.

Sound 71
Needs some serious work.

Overall:
We want to score this higher, but really...

73%

DC Universe Online

Look, up in the sky, it's another superhero MMO that doesn't quite deliver!

The superhero genre should really be one of the most natural contenders to slot into the MMO gaming space. You've got great costumes, derring-do, an already existing structure around which to model questing, and – if you've gotten hold of a license as broad and appealing as the DC Universe – a lot of material to mine for settings and NPCs.

So it's bit of a disappointment, then, that the game we've finally ended up with – DC Universe Online – just doesn't seem to be quite there yet.

Of course, the usual MMO caveats apply – it's early days yet, and most games of this type see significant changes in the launch period. SOE's already promised a lot of upcoming changes, in fact. For now, though...

Holy mentors, Batman!

The game's premise is certainly a corker. Essentially... Lex Luthor wins, and all the superheroes die. The end.

BUT!

In the aftermath, a gloaty Brainiac invades, takes over the Earth, and leaves Lex feeling a little like a jerk. So Lex travels back in time, warns the supers, and unleashes a wave of hand-wavey techno-magic junk into the earth's atmosphere that essentially causes a plague of super-powers. With a charming wink he tells Superman and friends to start reading up on Mentoring 101 and, presumably, buggers off to his own timeline before his present-day self can show up, steal his timetravel gear, and go even further back to be there with the adoption papers when Supes crashes into the Earth.

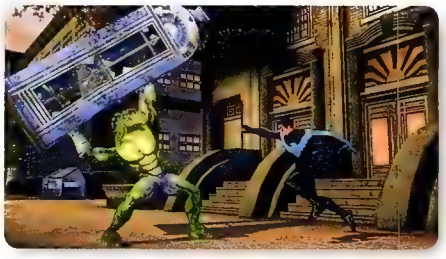
Or something.

It's suitably epic and comic-like, and the game's initial trailer – which is effectively the intro to the game itself – does an incredible job of making both comic-geeks and more general gaming-geeks spooge their pants in glee. Seriously, if you haven't seen it, take a moment from reading this review and give it a burl - **http://www.youtube.com/watch?v=H7Nf-m6WGl4.**

We'll wait.

...

See? Arguably some of the best superhero cinematics you'll ever see – gritty, high-fidelity action that puts some of comic's most iconic characters front and center. And that's the first problem – what the trailer promises is not what the game delivers. It's a mild niggle, but not the last.



Call me... First Strike!

Your first interaction with the game itself in DC Universe Online is character creation, and it does a pretty good job of not only getting you suited up and ready to rumble, but also thinking about the side you choose to fight on.

From the get-go, you can be a Hero or a Villain, and your choice of Mentor has an immediate impact on which city you start in and your first few quest lines. In terms of look and power choices, you can either customise everything down to the last pair of undies worn outside a leotard, or take your visual cues from an iconic character. For instance, if you want a look inspired by Superman, you'll have a tight-fitting, caped costume that's predominantly blue and red.

Going the custom route is pretty cool, though it's not a touch on City of Heroes/Villains excellent character creation scheme. You're limited to just three standard body types, and while the list of initial costume parts is extensive, it still feels small by comparison.

Similarly, the choice of powers is rather small, not to mention constrictive and arbitrary in terms of powers and the roles they play in combat. You can play a plant-controlling psychopath, but that means your powers are automatically healing-based.

All that aside, we rolled up three very different characters in the course of our reviewing: First Strike, a gadgeteer mentored by Batman, Bloodsky, a flying melee-type in the service of Lex Luthor, and finally a magic-wielding bow-user called... oh, something, under the command of Wonder Woman. At the very least, creating three very unique and differently skilled toons was pretty easy – they may not have been exactly what we wanted, nor as carefully fine-tuned as similar characters in the City of games, but they got the job done.

And that job is kicking arse

We rolled all of our characters on PvP servers. Initially, we figured it would be easiest to test both PvE content and player-versus-player stuff in one go. But, as it turned out, it's probably the best way to enjoy the game.

The MMO that does away with the dreaded grind has not yet been invented, but DC Universe Online takes a unique yet flawed approach to making the progress from zero to hero that much easier. First up, progression is *fast*. There are only 30 levels to achieve, and with each of our characters – especially the crowd-control expert gadgeteer, oddly – we got the first ten taken care of in a couple of hours.

Hell, the first two ding during the annoyingly repetitive opening level that sees you escaping from Brainiac's mothership.

However, that speed of progression is offset by some of the most mind-numbingly boring quests we've ever suffered through. It's a constant stream of kill-quests, essentially – either mobs or objects. No escort quests, no courier quests... just kill ten baddies and come back to me. Over, and over, again.

That level of repetition is bad enough, but a lot of the mobs you are killing have maybe a single line of dialogue, which they always utter when they die. We're not sure who was more annoyed – me, or my girlfriend, who was trying to raid Heroic Deadmines next to me!

The game's habit of repetition extends, too, to combat. Rather than have attacks either auto-generate, or be keyed to number keys, DC Universe uses a mix of Diablo-esque mouse-button attacks, mouse-button combos, and standard num-key-based skills. If it sounds confusing... it kind of is. There's no real rhyme or reason why some attacks can only be triggered by tapping the right mouse-button twice then holding the left-button down, and others use number keys.

It's a constant stream of kill-quests, essentially – either mobs or objects. No escort quests, no courier quests...

Combat's also a serious mashing enterprise. With the right load-outs – our bow-wielding magic user comes to mind – you can essentially drop most mobs in three shots, but harder fights generally become an inane series of clicks. Boss fights are even worse – their greater health means you can be sitting their clicking away for minutes on end.

This is not a game for weak and poorly made peripherals. More accurately, it's a game for console controllers, and the PS3 roots of the title are evident in everything from the combo-based controls to the the way you clunkily interact with NPCs.

However, the PvP structure of the game does a lot to make up for this. DC Universe's PvP servers are truly open. With the exception of a few vendor areas, there's no place you can't get into an open scrap. Of course, this does lead to some seriously heavy ganking, but with a bit of communication you can usually call in a little help. And after all, comic book heroes are all about finding badguys (or goody-two-shoes, if that's your thing) and beating them up – the whole ganking mentality of camping a PvE quest area to pick on folks just means the action comes to you.

Sadly, the combat is no less clicky, but at least with real players comes some great synergetic uses of skills and powers. Crowd controllers can leash flying supers, while bruisers and ranged DPS types lay on some serious smack. Sure, the game's engine's nothing to wrote home about, and thanks to being little more than a console port it doesn't even feature the most basic of PC graphics tweaking ability, but with semi-destructible environments a fast-paced brawl can be a lot of fun.

However, there are also certain builds that seem custom made to give their users a hella edge. Namely, combining flight with any kind of ranged attack power is basically a ticket to PvP godhood. We got ganked repeatedly by a lower level toon using the combo, so tried it out.

It's hacks, pure and simple. By hovering above a PvE fight you can simply pick off wounded players with near impunity – you're simply too hard to see and target.

Annoyingly, though... it is fun.

The greatest crime

But the thing that really annoys us about the game is that, except for a few scenes, the most iconic DC characters are relegated to little more than quest givers. Think about it – Superman has the power to, basically, fuck up any shit he chooses, but in DCU all he does is give you directions while apparently sipping frosty lattes in the Fortress of Solitude. One of the things that a great game can do with an established license is draw you as a player into the action – the way Lord of the Rings Online makes you an essential part of the War of the Ring, and a companion of the likes of Aragorn and Frodo without sidelining them, is a perfect example of doing it right.

DC Universe, and its relegation of the likes of Batman and The Joker to little more than talking heads is a perfect example of doing it wrong.

There's a lot of potential to DC Universe, and while it's lacking in polish, and features some truly annoying mechanics, the draw of open-world PvP and cruising for villains to punish is at least still keeping us interested. But there are a lot of great games around the corner, and we suspect that it's not going to take a lot to distract us... **DH**

PC, PS3 (reviewed on PC)

Developer Sony Online Entertainment
Publisher Sony Computer Entertainment
Website www.dcuniverseonline.com

Gameplay 74
Repetitive in the extreme, offset by broad PvP options.

Graphics 71
Console-port-tastic!

Sound 65
Poor voice-work, adequate music.

Overall:
Desperately in need of some post-launch love and attention.

69%

MOVIE

TRON: Legacy

Shall we argue about pacing or can we just ride around on lightcycles for a couple of hours?

Director Joseph Kosinski
Starring Jeff Bridges, Garrett Hedlund, Bruce Boxleitner Olivia Wilde, Michael Sheen

Sometimes a movie comes along that has everything going for it: great cast, great writing, flawless direction, but, for whatever reason, it just fails to spark. TRON: Legacy is not that movie. It is actually the exact opposite of that movie: this is a movie that works in spite of itself.

Because it isn't really a very good movie. It has its good points – visually, it's awesome, and Daft Punk's score, while very occasionally a little intrusive, is great – but in the big make-or-break elements, it never really gets above okay.

Take the writing. It's fine – but just fine. Screenwriters Adam Horowitz and Edward Kitsis both come from television backgrounds, and the dialogue definitely has touches of the soapy, superficially emotive style that you might expect from people who've come from shows like Felicity and One Tree Hill. Be prepared for the occasional descent into cliché, and maybe have some crackers handy for the cheese. Tonally, there seems to be a bit of an identity crisis going on. For the most part, it's all just good fun, but sometimes it feels like they're striving for something much deeper, but without the skill to really pull it off.

The bigger plot is more problematic. Things start off fine, but at some point it seems like the writers realised they just had too many story threads to deal with and a few storylines that seemed like they were going somewhere were just dropped. The Tron character, for example, pops up at a couple of pivotal moments but, other that making the other characters exclaim 'Tron!' in awe and/or annoyance, doesn't seem to fit into the story anywhere.

Jeff Bridges is, predictably, a shining light of awesome in an otherwise fair-to-middling cast, and, while he gets top billing, the task of carrying the movie actually rests on the shoulders of one young Garret Hedlund. Hedlund is, again, fine – he delivers his lines without causing offence or sounding overly wooden – but he lacks the sort of charisma that might have made his character memorable. Olivia Wilde, who I usually quite like, takes almost the whole movie to win me over, and it took a lot for me to get past the feeling that she was horribly miscast (but oh so pretty – ed).

And yet, despite this, TRON: Legacy was really a lot of fun. The competition scenes were perfectly executed and went on for just long enough to not get boring, and the visual effects, and, indeed, the production design as a whole, made the whole thing look great: at once retro enough to tie back into the original movie, and modern enough to not seem dated. And who didn't leave the cinema wanting a lightcycle of their very own?

It also managed to use 3D where it needed it, without feeling the need to use it in every single scene – which is refreshing in this day of 'look! We're throwing something at you!' scenes.

If you go in looking for intricate, well-realised plotting and Oscar-worthy performances, you will come out disappointed. On the other hand, if you just want to turn your brain down for a couple of hours and take a fun ride through a pretty land of electric lights, then TRON: Legacy really does hit the spot. **EG**

Overall
Not a classic, but plenty cheesy. And we like cheese.

81%

atomic MAXIMUM POWER COMPUTING

CULTURE SHORTS

It was a prequel to Alien, but now it's just Promethius – a standalone sci-fi epic. Ridley Scott is still directing and Alien is still 'the jumping off point', but what that means is anyone's guess, at least until 2012.

20th Century Fox seem determined to bring 80's arcade game Missile Command to the big screen. The project is only in development at this point – and, if similar past projects are any indication, it may well stay there forever.

It's possibly the biggest Blu-Ray announcement of all time, or at least of 2011 so far. The entire Star Wars saga will be hitting Blu-Ray in September. And if you are one of those pretending Episodes I-III don't exist, fret not: there will be an Episode IV-VI box set available too.

The Matrix 4 and 5 are go! At least according to Keanu Reeves. Rumour has it that the Wachowski brothers have written a two-movie treatment, and that there may very well be 3D involved. We feel like we should be happy about this, but ... we're mostly just afraid.

The endless restart loop

Ben Mansill reckons that if he's going to spend a three day weekend playing a single game, the game world may as well be perfect.

There are two ways to play most games – the kinds of games I like, at least – and that's properly, and cheaty. I'm not talking cheat codes, which are galactic lameness, and I personally hardly ever do. Or exploits, which as far as I'm concerned are fair and sporting.

The cheaty that I'm fessing up to, today, doesn't have a name, so I'll just call it '*re-starting a game over and over and over until the initial-phase conditions are ideal*'.

Case in point: Civilization IV's World Builder. Horrid bastard of a thing. I'd use it to reveal the map right at the start, before anything is built or the Settler and Warrior have even moved. I'd survey the lay of the land, check out the start locations of the other races, make sure I had a nice isolated continent, ideally without any AI company. If everything looked good I'd save and restart, leaving World Builder alone and playing 'properly' from that point – comfortably knowing in which direction lay danger, and with a fair idea how my cities would be optimally arranged.

Doing that really wasn't cheating, I'd tell myself. The void was still black, exploring was necessary and at some point a Trireme would turn up and diplomacy, followed by some combat, would ensue. By that stage, though, I'd have a majestic super-economic bastard empire with a modern air force and a dozen battleships, a poster child of perfection, while the well-meaning AI had to contend with sharing a crappy island with a couple of other races.

This cheaty and unsporting syndrome manifests horribly with racing games – and I know we've all done this.

The trouble is that I'd have to start a new game many, many, many times to get the world I liked. The cyclic repetition burns into the brain, click here – choose the world parameters, click there – choose the races and difficulty… game loads, check out the world – nope, no good, start again…. It becomes subconscious, moving the mouse to the spot on the next screen before it even loads. This is why people like me hate games that don't save last-game settings.

Master of Orion 2 was particularly dastardly. I'd get to the point where I'd start a 'random' universe upwards of a hundred times before I was satisfied (using the Omniscient skill, of course, so I could see the whole map). Then, of course, I'd play the game properly. Tucked away in my safe little corner, surrounded by the most incredibly rich star systems, with the enemy AI packed as far away as possible into the opposite corner, with extremely crappy systems and unfriendly close neighbours.

It's an optimum-world kind of playing. A politician's wet dream, where resources are insanely abundant, the people just can't help but love the chief and there'll be at least a thousand years before any warmongers come knocking.

This cheaty and unsporting syndrome manifests horribly with racing games – and I *know* we've all done this. Race stars, everything is great but you come off on the first lap. No worries! ESC, Restart. Try again. And again. And a-bloody-gain. The trouble is, as you do this your baseline standard shifts. Upwards. Initially it's all about 'just making it through the first lap', and you promise yourself that 'no matter what happens after that', you'll persevere. Then at some point you'll pull a legend start and slam up the straight from 14th to 3rd position. Well, now that you know that's possible… I've spent entire afternoons restarting a race just to replicate the perfect hero lunge. The statistical maths are ridiculous, and get worse when you do manage a legend start, but then come off on the following corner. It gets to the point where there's virtually no chance whatsoever that you'll finish the first lap according to your ever increasing standards.

A similar thing happens with FPS games, and I *definitely know* we all do this. I'm not talking about dying and reloading, but rather reloading to do a bit just a little better. Say you've rounded a corner while packing a machine gun to find a horde, and invested a hundred panic-rounds to clear the room. No worries mate, reload, switch to sniper rifle and swing in with a nice "surprise, boys!" as you headshot the spots you know they'll be. Tidy.

There are solutions; enforcers that make you play properly. For FPS games it's the checkpoint. Best FPS game experience I ever had was Far Cry. Really hard game and no save game option. Plus the checkpoints were spread right out.

For racing games it's multiplayer. Funny how much harder you're capable of concentrating when it matters… Unfortunately for the Civs and MoOs there's only self-discipline.

Needless to say I play a lot of Civ V. Partly because it's an evolutionary masterpiece of the series – but mostly, well mostly because there's no World Builder.

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